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How Locomotives Are Repaired on Ford's Railway

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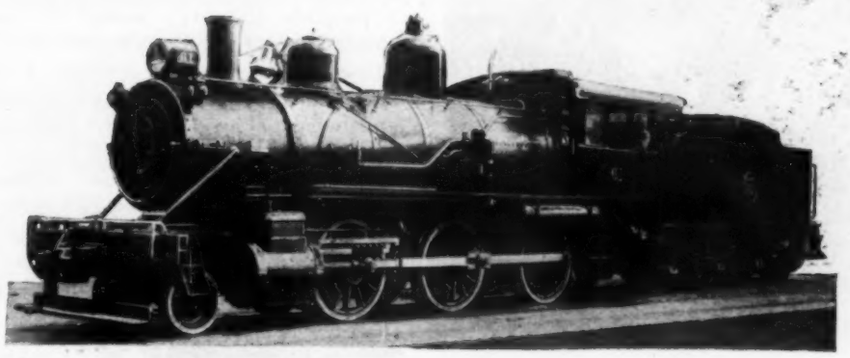


IN PLANNING for the reconditioning of the locomotives of the Detroit, Toledo & Ironton Railroad, Mr. Ford has abandoned what had been considered the prevailing method, particularly with freight locomotives, so, instead of making the locomotives as plain and unattractive as possible, which is the usual custom at the present time, he laid his plans on the theory that the average engineer and mechanic are attracted by a good-looking piece of machinery and, in consequence, take better care of it. Making the locomotives attractive looking, in connection with the standardization of as many parts as possible, may perhaps best indicate the main difference between the Ford method of maintaining motive power and that practiced on other roads. As an example of this, we are illustrating in the head piece, a typical mogul, or 2-6-0 locomotive, with its standardized number, cab and tender.

Nickel Plated Parts

It will be noted that the hand rails, cylinder heads, steam chest covers, locomotive numbers and the monograms on the tender are all nickel plated; that the side rods are polished and that everything is ship-shape, including the planished Russia-iron jacket over the boiler. The cab fittings are also nickel plated and the furnishings are as attractive as possible. An indication of the latter may be had from the chairs provided for both engineer and fireman, one of which can be seen in the cab in Fig. 1.

Another convenience is the tool box under the cab also shown in Fig. 1. This box contains a small vise and such tools as may be necessary for ordinary work. While this is contrary to modern practice, it must be remembered that the D. T. & I. is a comparatively small railroad instead of a trunk line, and that many of the conditions which had to be met in the earlier days of railroading still prevail on a road of this kind. It will also be noted that an electric trouble lamp is provided in the tool box which is a marked advance over the old engineer's torch formerly used.

The repair shop of the Detroit, Toledo and Ironton Railroad is at the Ford plant on the River Rouge, just outside of Detroit, Mich., and its equipment would make nearly any railway shopman turn green with envy. As with other Ford machine equipment, it was selected with the sole idea of securing economical production. All machine tools do not look alike to the purchasing department, the machines deemed best suited for the work being ordered as specified.

There are three departments, the erecting shop, which is in a separate building designed and built especially for the work, and the machine shop and store room which are part of one of the huge buildings which go to make up the Ford Plant at the River Rouge. The machines are closely spaced, as in the Ford shop itself, to reduce handling of material but there is ample room for each operation.

Some Ancient Motive Power

The motive power of the D. T. & I. when taken over by Mr. Ford consisted of 80 locomotives of various makes and sizes and in almost every state of decrepitude. Some of these locomotives date back to the old Rhode Island Locomotive Works, and the Rogers Shop, and others are equally ancient. There were 17 types of locomotives to keep in repair, with the attendant expense of making and carrying in stock 17 different kinds of parts for at least a portion of the locomotives. On some of the larger railroads, the different kinds run up into the hundreds.

One of the first steps of the Ford management was to begin the standardization of such locomotive parts as seemed feasible, as fast as the different locomotives came into the shop for overhauling. For example, two sizes of steel cabs have been designed so as to fit all of the 17 types of locomotives. One of these cabs is shown

FIG. 1—CONVENIENT TOOL BOX

in Fig. 2. Running boards and front bumpers have been reduced to a single standard, new ones being fitted as fast as the locomotives come into the shop, whether the old ones are worn out or not. Tender frames are rebuilt to new standards, and three sizes of trucks, one of which is shown in Fig. 3, are used for all 17 types of tenders. One of the new tender tanks is shown in Fig. 4.

Crankpins and side rods are replaced with new ones of vanadium-alloy steel as fast as the locomotives go through the shop. The crankpins are hardened and ground to standard dimensions, the standards being covered by several sizes to fit all locomotives. When the crankpins wear so as to require regrinding, and

FIG. 2—ONE OF THE STANDARD STEEL CABS

FIG. 3—STANDARDIZED TENDER FRAME

they have a very much longer life than the kind of crankpins generally used, they are ground to a specific size rather than being merely "cleaned up" as is the usual practice. Any attempt to true up a crankpin with a file, as is too often done in railroad shops, would not be tolerated here.

VANADIUM STEEL PINS AND RODS

The practice of maintaining standard size pins makes it possible to carry boxes or bearings in stock in standard sizes, and prevents much of the present-day fitting. Moreover, it insures a much longer life to both the crankpins and their bearings and helps to lengthen the useful life of the locomotive between "shoppings."

Connecting and side rods are also made to as few standards as possible, the new rods being forged at the Highland Park plant of the Ford Company. Some of the operations in making the rods are shown in Figs. 5 to 8. In Fig. 5 a large double-head rod-boring ma-

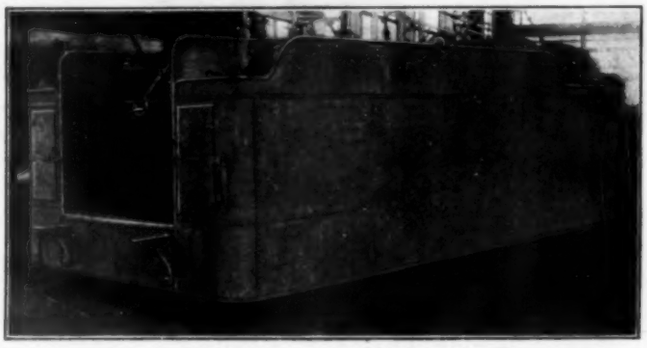


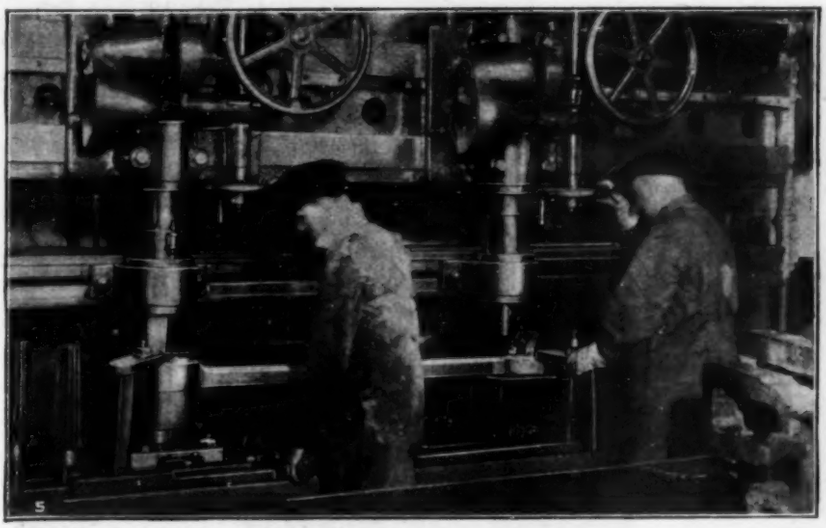
FIG. 4—ONE OF THE NEW TENDER TANKS

chine is shown at work on a side rod. As will be seen, there is a man at each spindle, the object being to get all the work possible out of the machine instead of attempting to save labor cost on the part of the operator.

MINIMIZING SPRING BREAKAGE

The main rods are forged with some of the metal cut away, which, particularly in the case of the back end of the main or connecting rods, greatly reduces the work to be done by the slotting machine. It is understood that there has not been a case of rod breakage where the new vanadium steel rods have been in use. Locomotive springs also gave considerable trouble from frequent breakage. Springs having a record of over a year's service without a break are now made at the Highland Park plant. It is just possible that the railroads might learn something about springs and spring material from the builders of automobiles.

A detail of the rod-boring machine is shown in Fig. 6, where a large solid end rod is being bored with a substantial head carrying a single-point boring tool.



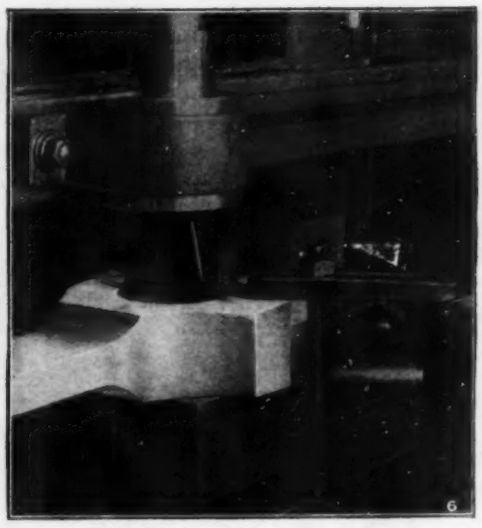
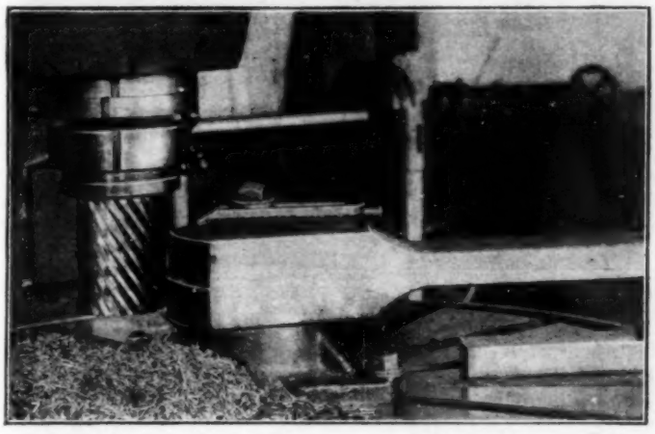


FIG. 5—DOUBLE-HEAD ROD BORING MACHINE. FIG. 6—THE BORING HEAD



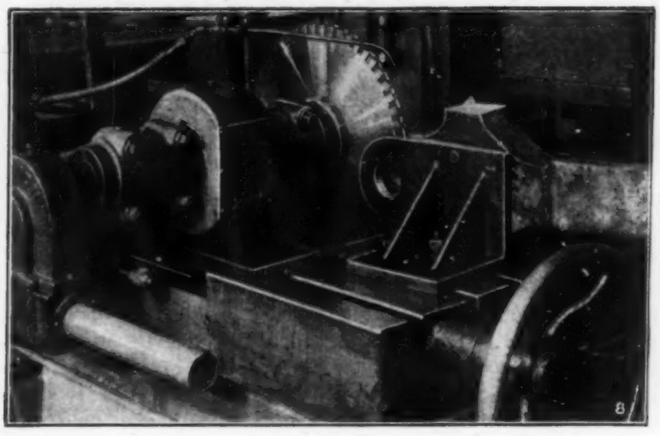


FIG. 7—MILLING THE ROUND END. FIG. 8—SAWING THE SLOT IN ROD END

This view shows the rod painted white for laying off and the way in which it is clamped for boring. Fig. 7 shows a typical method of milling the round end of a side rod, using a substantial vertical-spindle milling machine and a modern cutter for this purpose. The chips shown indicate something of the way in which the metal is being removed by the cutter.

The slotting of the back end of a side rod for a knuckle joint connection is shown in Fig. 8. Here, a large hole is drilled vertically through the end at the proper position to form the inner end of the slot in the yoke. The rod is then clamped in position on the Newton sawing machine shown and fed against the saw or cutter. The slot is completed in two passes of the saw, one on each side, leaving the yoke practically ready for the mating rod. This method is much quicker than cutting in from the end with a long milling cutter supported at the lower end as is sometimes done. One of the striking differences in repair practice developed at the Ford shop, is in the treatment of hub liners for locomotive driving wheels. Usual practice varies from casting a babbitt liner on the wheel hub, up to putting on a liner made of boiler steel about $\frac{5}{8}$ in. thick. The most usual method is to cast a hub liner of brass, mostly scrap, and this practice is quite common when it comes to the driving box itself. The Ford method discards these usual practices, and inserts a hub liner of hardened and ground vanadium steel, as shown in Fig. 9. The hub liners are made in solid rings, as shown at *A*. They are drilled with 8 holes spaced as shown, and countersunk on one side. Three grooves are cut in each countersink to prevent the locking bolts from backing out after they have been

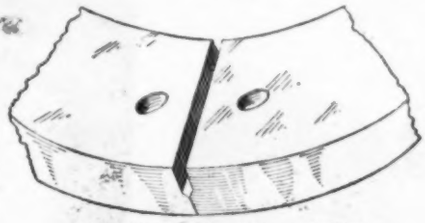


FIG. 10—SLOTTING LINER FOR BREAKING

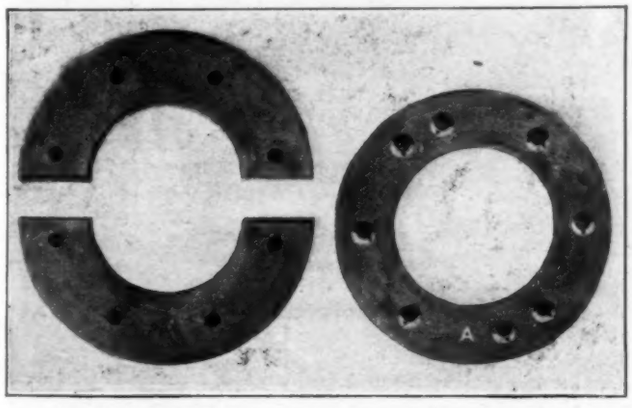


FIG. 9—VANADIUM STEEL HUB LINER

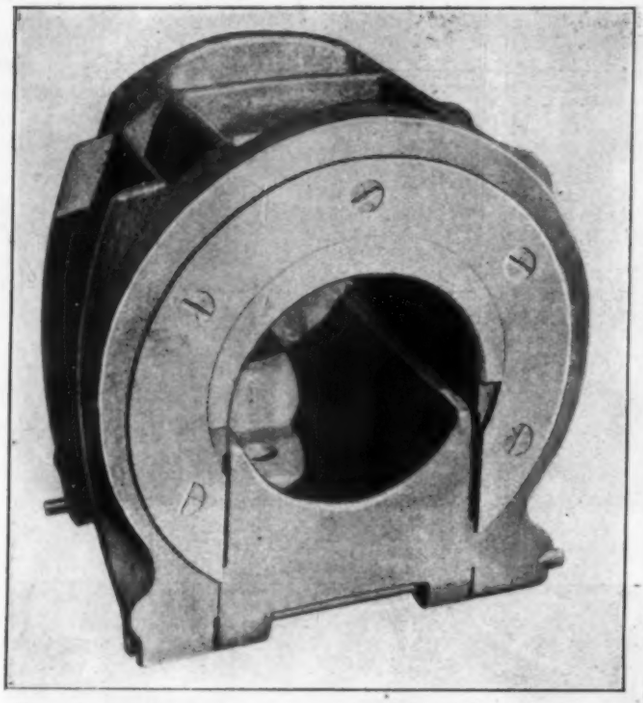


FIG. 11—NEW DRIVING BOX

put in place. A slot is milled across each ring on the back side between the two closely spaced holes, for something more than half the thickness of the ring, as shown in Fig. 10. The rings are then hardened and carefully ground on a Blanchard machine to a uniform thickness and with a very smooth surface, after which they are broken through the milled slots, so that they can be put around the axles, and will fit together without any machining of the joint. They are held in place with cone head or "patch" bolts, as they are

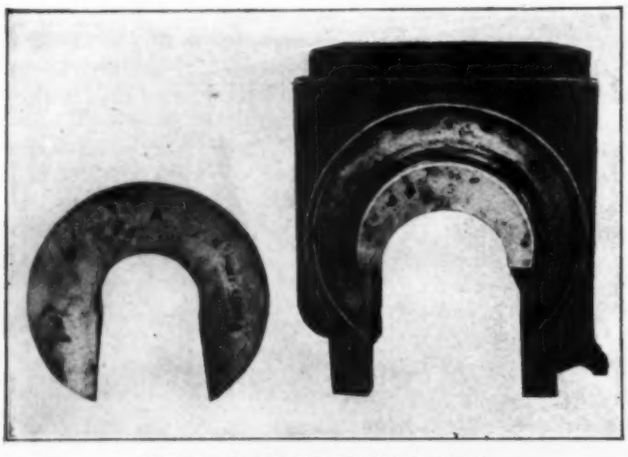


FIG. 12—BRONZE FACING RING

usually called, and a heavy center punch blow at three points on the cone head drives the metal into the grooves mentioned so as to effectually prevent the bolts backing out in service.

Fitting the Driving Boxes

The steel driving boxes are counterbored and faced with bronze rings, as shown in Figs. 11 and 12, the former showing a completed ring in place and the latter the method used in producing it. These facing rings are castings as shown at *A*, Fig. 12, and fitted into the recess in the driving box as shown in Fig. 11. The ring surrounds the crown brass and both are faced off together, so as to present a uniform bearing to the vanadium hub-liner already referred to. It is interesting to note in this connection that a year's service indicates but $\frac{1}{8}$ in. wear over the original play allowed when the locomotives leaves the shop. As this wear is almost entirely on the bronze ring, it would indicate that the vanadium hub-liner should last practically as long as the driving wheel itself. This method overcomes an expensive source of repairs, as experienced on the average railroad.

A method of boring tender- and locomotive truck-brasses is shown in Fig. 13. Here two brasses are

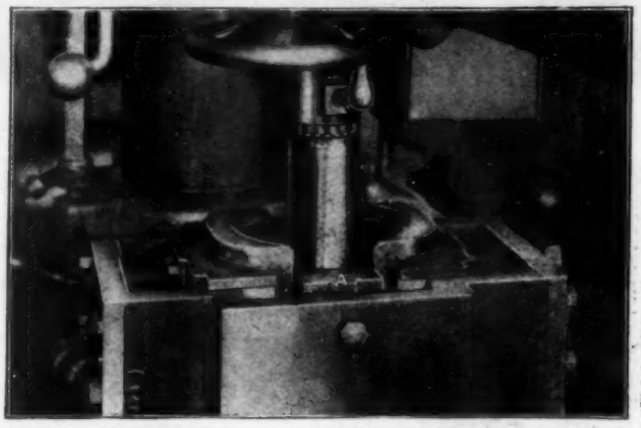


FIG. 13—BORING TRUCK BRASSES

clamped in a rapidly operated boring fixture under a husky radial drilling machine and the brasses are bored rapidly and accurately. It will be noted that the brasses are separated by the space block *A*, which represents twice the distance from the edges of the brasses to the center of the axle. This fixture can be rapidly handled and insures good production.

Every locomotive that goes through the Ford shop leaves it with nickel-plated brass cylinder head covers, nickel-plated cab fittings, nickel-plated monograms on the tank, and other fittings which appeal to the pride of the average railroad man. The machining of one of the cylinder head covers as shown in Fig. 14, is a regular boring mill job and is being done on a Colburn machine. It is afterward polished and plated and is in striking contrast with the usual black head.

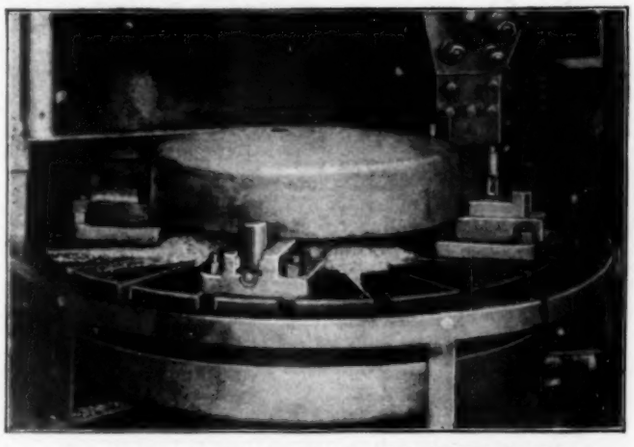


FIG. 14—MACHINING BRASS CYLINDER COVER

Die Casting Process and Equipment

By JOHN W. HARRIMAN

Construction and operation of a die — What to allow for shrinkage—Methods of forcing molten metal into the die

EVERY ENGINEER should be well informed as to the possibilities and limitations of die-castings, so that he may apply such methods of casting to the problems which he will encounter in production, and so may apply his ability to the further development of this new craft. It is only in the last eight years that aluminum has been successfully die-cast. Brass

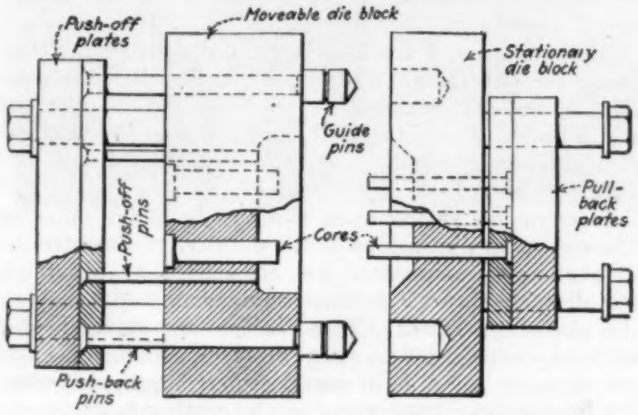


FIG. 1—SIDE VIEW OF A TYPICAL DIE

die-castings are still in the experimental stage and the reward seems unlimited to the man who will eventually die-cast iron.

Many small, intricate parts are still produced at a great expense by machine work when they could be effectively replaced by die-casting at a much lower cost. When a part that is produced by several machining operations upon a sand casting, can be accurately cast to the finished dimensions at the rate of forty an hour, a great saving has obviously been affected.

Unlike much industrial machinery, such as machine tools, which may be bought from the manufacturer, die-casting machines are designed and built by the individual concerns producing the die-castings. Each concern has its corps of expert designers whose entire time is devoted to the development of new machines for the use of that concern. Consequently, a keen rivalry has grown up between the different companies. Each concern has men in its employ secretly placed in the shops of its competitors to observe and make reports on new machines, dies, alloys, or methods of producing difficult castings. Watchmen are placed at the entrances to the shop, and the employees are admitted only upon presenting their number and tag. Newly designed machines are detailed only by draftsmen known to be loyal to the firm. Excessive curiosity is regarded with such suspicion that little information has been gathered and published. Lately, however, manufacturers have realized that the industry has suffered from this lack of publicity, and efforts are being made to inform the public concerning the advantages of the die-casting process, although concerns continue as zealously as ever to guard their individual achievements.

Stated briefly, the die-casting process consists of forcing molten metal under pressure into a steel mold that is fitted with suitable cores, and then knocking the solidified casting out of the mold.

It would be futile to attempt to cover the design of die-casting dies by the description of a single die, for each die possesses features peculiar to itself. It is this variety of design that makes the work of the die-maker and die-designer interesting, for die design requires more than the ordinary imagination and initiative. There are certain details of construction, however, that are common to almost all dies, and a description of these details should give a general understanding of their construction.

In Fig. 1 is shown a side view of a typical die which has cores in both halves. Fig. 2 illustrates the cycle in which the die operates. At *A* the die is closed and the cores are in position ready to receive the metal. At *B* the pull back plates are drawn back and the die is open. The casting is shown in the movable block. At *C* the casting is knocked out. At *D* the die is closing.

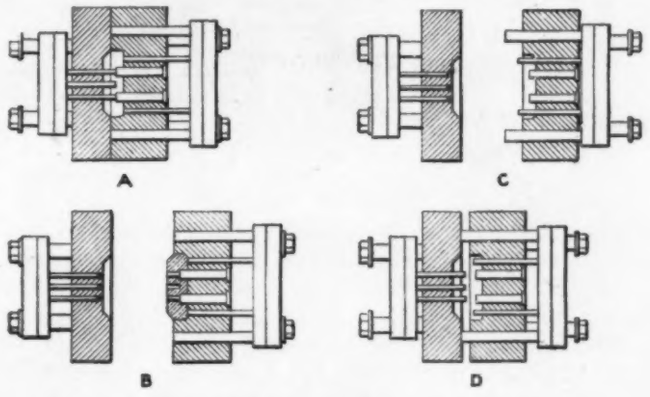


FIG. 2—THE CYCLE IN WHICH A DIE OPERATES IN PRODUCING A CASTING

The push back pins are bearing on the stationary block to bring the push off pins flush with the die cavity when the die is closed.

All dies are made in two halves. A complete die may be described as a complicated mold which is made of steel and designed to be used many times. The two halves of the die correspond to the cope and drag of a mold. When used on the type of machine described in this article, they are called the stationary die block,

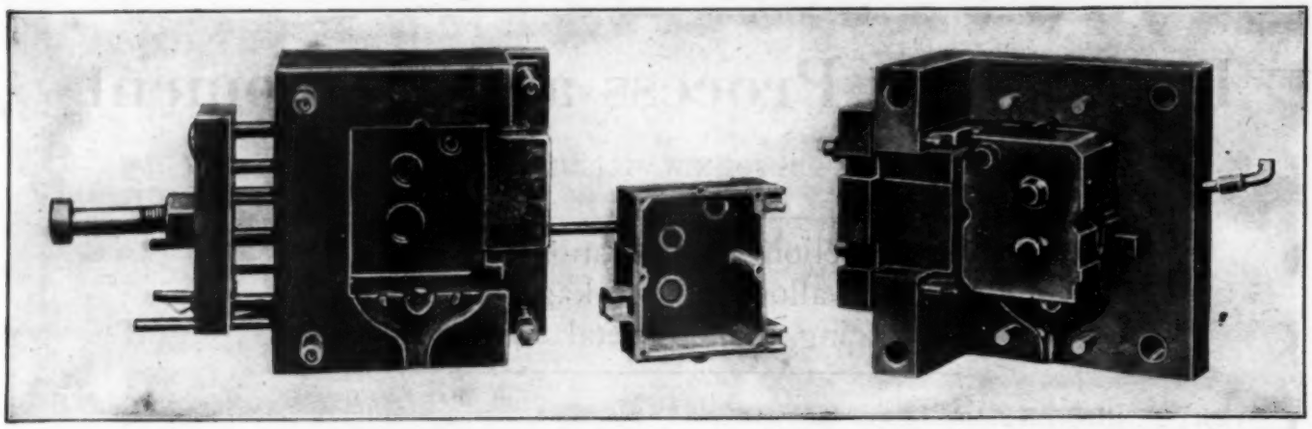


FIG. 3—DIE-CASTING DIE AND THE WASHING MACHINE GEAR BOX IT PRODUCES

and the movable die block. The former block is stationary on the carriage of the die-casting machine, while the latter is fastened to the movable plate and is moved away from the stationary block to open the die.

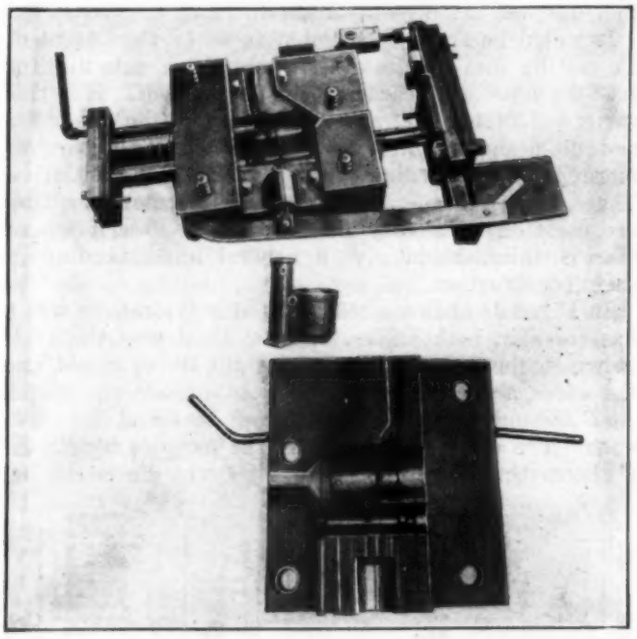


FIG. 4—DIE-CASTING DIE AND THE CARBURETOR BODY IT PRODUCES

To insure the proper alignment of the two blocks when the die is closed, four guide pins are set in the movable block. They are accurately ground to fit reamed holes in the stationary block.

The parting line to be followed determines the nature of the surfaces of the blocks that coincide when the die is closed. If the parting line is in a single plane, as in the simplest cases, the surfaces are ground flat and parallel. For many intricate castings, however, the parting line must follow a very irregular path, causing a complex joint between the two blocks. When it is considered that this joint between the two steel surfaces must be tight enough to hold the liquid metal under great pressure, it becomes evident that diemakers employed in this work must possess exceptional skill.

Die blocks are made from tool steel, or certain commercial steels having heat-resisting qualities of a low coefficient of expansion. The size ranges from 6 in. square up to 16 by 24 in., depending of course, upon the size of the casting, though certain types of machines require larger dies than others. The thickness depends upon the depth of the cavity and the mechanism necessary to operate the cores. Both die blocks are water cooled.

In Figs. 3 and 4 are illustrated dies and the castings produced with them. The casting in Fig. 3 is the gear box on an electric washing machine and is made of white brass. It weighs 11 lb. and is one of the heaviest castings ever die-cast. The casting in Fig. 4 is a carburetor body.

Since metals shrink upon cooling, shrinkage must be allowed on all dimensions of the die cavity. Repetitions of shrinkage calculations are eliminated by providing the draftsman with decimal equivalent tables having the shrinkage added. These tables are made up for each die-casting alloy. The problem of shrinkage is not as easily solved as it would at first appear, however, for in many cases the shape of the casting is an important factor. A solid, heavy casting would have less shrinkage than a light bracket or frame. Die-cast, elliptical, aluminum frames for plate glass automobile curtain lights have a greater shrinkage per inch along the major axis than along the minor axis.

To correctly determine shrinkage, a designer requires good judgment and extensive experience. Mistakes here are expensive, because to remove a few thousandths of an inch of metal from the surface of an irregular cavity is a slow operation requiring skill. To facilitate the removal of the casting from the die, draft is necessary on all cores and side walls. The amount varies from 0.005 in. per in. of side wall for aluminum castings to 0.001 in. per in. of side wall for tin base metal castings.

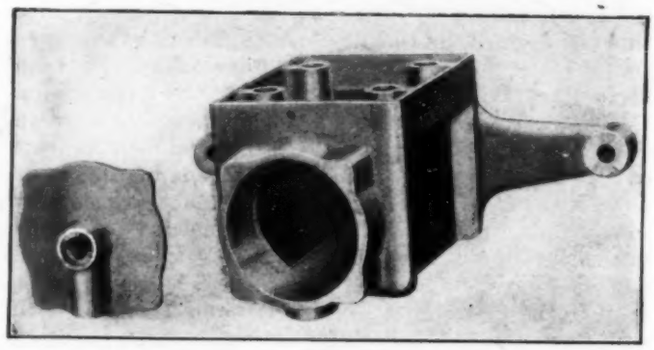


FIG. 5—DIE-CASTING MAGNETO HOUSING SHOWING USE OF INSERTS

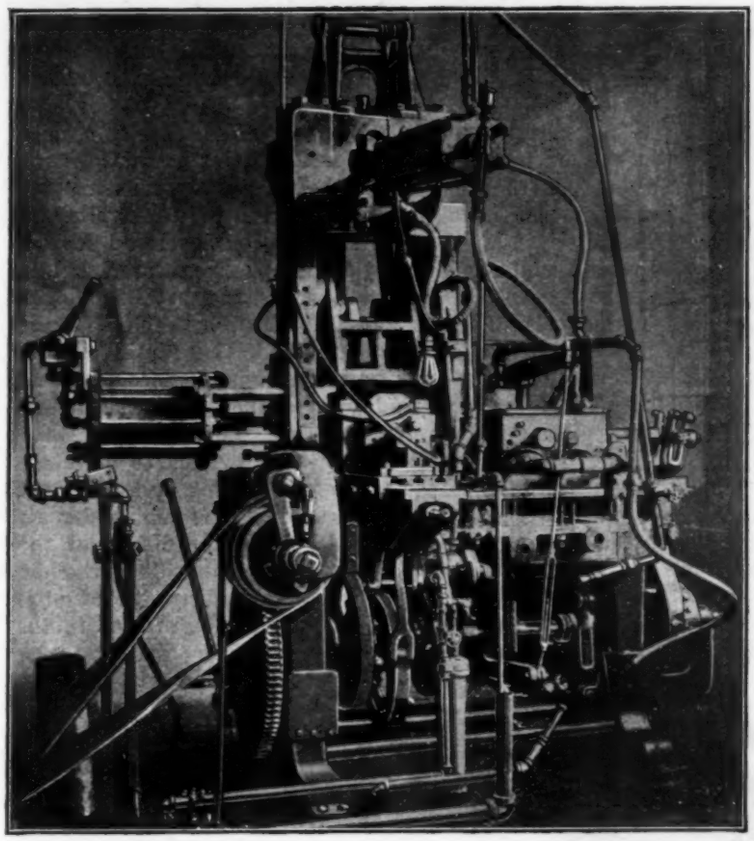


FIG. 6—A VERTICAL AUTOMATIC DIE-CASTING MACHINE

The die-cast magneto housing and end plate in Fig. 5 illustrate the use of inserts in die-castings. The brass bushing in the end plate and the iron field poles in the housing have been cast in place.

Holes are made by steel cores that protrude into the die cavity. The draft allowed on cores varies from 0.015 in. for each inch of diameter or length of core for aluminum castings to 0.0005 in. for each inch of diameter or length of core for tin base metal castings. It is important that the casting shall stick in the movable die block when the die opens, because the means for knocking the castings out of the die are attached to this block as shown in Fig. 1. If it is necessary for cores to enter the cavity from the stationary half, they pass through the block and are fastened to the two plates called the "pull back plates." The cores are free to slide through the die block. After the casting is "shot," these plates are drawn back, removing the cores, and thereby reducing the tendency of the casting to stick in the stationary block.

Whenever it is possible, however, the cores are permanently set in the movable block. This method disposes of the pull back plates, and serves to hold the casting in the movable block. Cores entering the side of the die are guided by cast-iron bushings set in one or the other of the blocks, and are drawn by the operator, before the die opens, by means of levers attached to the die.

After the die has opened, the casting is knocked out of the movable block by the "push off pins" fastened in the "push off plates" as shown at *C* in Fig. 2. These pins, which are made to have a sliding fit in the block, pass through the die block into the die cavity and are finished flush with the cavity when the push off plates are drawn back. When the casting has been shot and the die opened, the push off plates are driven forward, and the push off pins knock the casting out of the block.

Now it is evident that if these plates were left in the forward position, the push off pins would protrude into the die cavity leaving their impression in the next casting. Additional pins are therefore fastened in the push off plates and slide through the die block, but do not enter the die cavity. These pins are finished flush with the surface of the die block when the push off plates are back. They are called the "push back" pins. If the plates are forward when the die closes, these pins will bear on the stationary block while the movable block moves forward until the pins are flush with its surface and the push off pins are flush with the die cavity.

Die-casting machines and, in fact, the whole die-casting process, are an outgrowth of type-casting machines, and the linotype machine is a machine developed to produce a certain kind of die-casting. Fig. 6 shows a vertical type of automatic die-casting machine. Fig. 7 presents a horizontal type of the semi-automatic die-casting machine.

It is difficult to determine the period during which

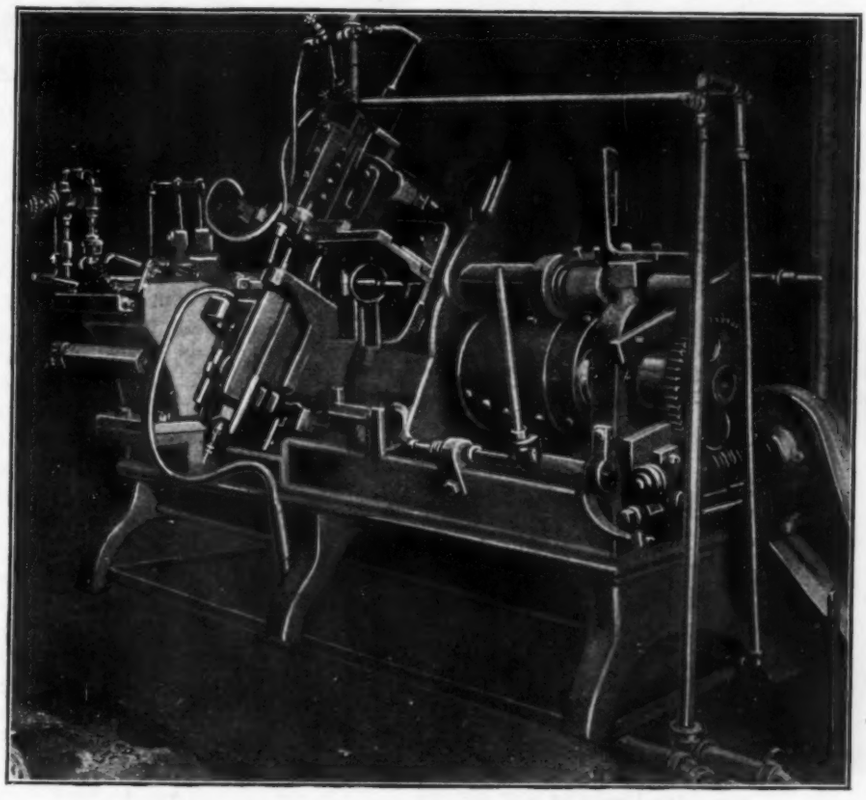


FIG. 7—A HORIZONTAL SEMI-AUTOMATIC DIE-CASTING MACHINE

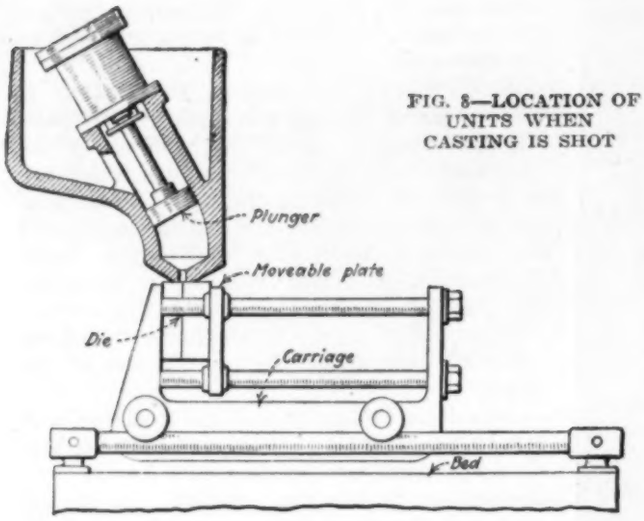


FIG. 8—LOCATION OF UNITS WHEN CASTING IS SHOT

modern die-casting machinery was introduced, for its development from type-casting machinery has been gradual. The earliest record of an attempt to adapt type-casting methods to the manufacture of other kinds of castings is in a patent granted to C. and B. H. Dusenbury, in 1877. This patent was on a small hand-operated machine adapted only to metals having a low fusion point. It was not developed until 1892 when additional claims on a similar machine were allowed C. W. Weiss. These small machines have been used to produce trivial lead trinkets such as are sold at fairs and expositions.

In the early part of this century, a machine was made by the Soss Manufacturing Co., of Brooklyn, N. Y., that, although only a primitive hand-operated type, embodied the same general principles of design found in all succeeding die-casting machines, including the present automatic machines. These principles are: A carriage supports the stationary die block, moves back and forth over the bed and passes under the pot of metal at one extremity of its path; a movable plate carries the movable die block, and slides on the carriage so as to bring the two halves of the die together; a means by which to draw the cores from the die-casting, and to knock the casting out of the die. The diagram of the units of a die-casting machine in Fig. 8 shows these principles of design.

The metal is not poured into the die, as into a sand mold, but is forced into the die under pressure, thus filling out the corners of the casting, preventing air cavities, and insuring a smooth accurately cast product. Two distinct styles of pots have been developed for delivering molten metal to the die at a pressure of 250 lb. per square inch. With both styles, the metal is alloyed in the melting ladles and is carried by each operator to his machine. By this method, the castings from different machines will have the same composition, and an analysis may be made of the alloy when the metals are being mixed in the melting room.

The pots are sufficiently heated by gas to maintain the metal in the molten state. In one style, the pot is made airtight, and the metal inside is kept under air pressure. When the carriage brings the die under the pot, a valve opens, and the metal spurts into the die cavity. This type of pot has the advantage of simplicity, but with its use trouble from air holes in the casting is often experienced.

In the other style, the pot is made airtight. A plunger working in a cylinder and submerged in the metal operates by means of compressed air. Openings in the side of the cylinder admit the metal, as illustrated in Fig. 8. The metal is trapped by the plunger on the downward stroke and is forced through the open valve into the die cavity. It is easier to maintain the supply of metal in this style of pot, and castings produced by it are generally free from air holes. It also delivers the denser metal from the bottom of the pot where the metal is free from the many impurities that rise to the surface.

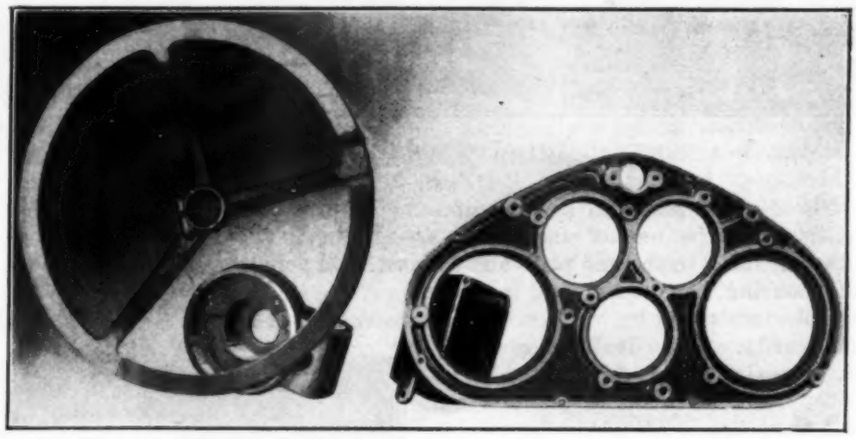


FIG. 9—SOME ALUMINUM DIE-CASTINGS

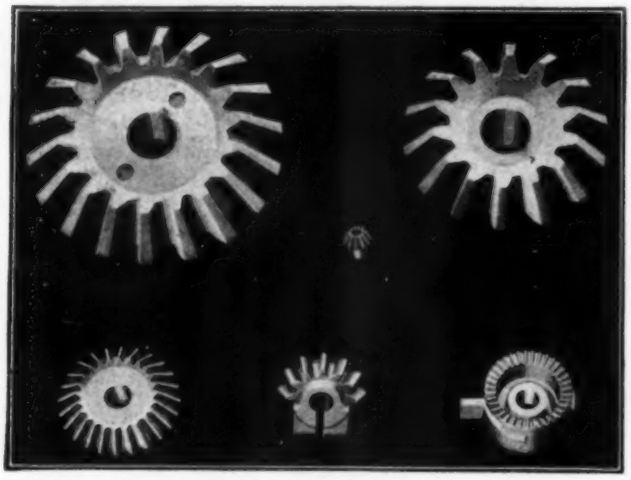


FIG. 10—DIE-CAST GEARS

This type of pot is represented in the diagram of the units of a die-casting machine shown in Fig. 8. The pot is located above the die in this diagram, which is the most logical place for it, although some manufacturers place the pot on one side or directly behind the die. The carriage moves forward under the pot, the movable plate carries the movable die block along the carriage to the stationary block, closing the die. Then the operator places the cores in position and the parts are located as Fig. 8 shows.

From his shielded position behind the machine, the operator reaches above his head with both arms and gives a short jerk on the valve lever. A low hiss, a

sharp report as the exhaust valve opens, and it is all over—if everything has gone smoothly. But many a trusting young draftsman sent to the shop to measure up a job has been burned by a spray of molten aluminum that often spurts out from between the die blocks, sometimes even clearing the ten foot sheet iron partitions hung between the machines.

The cores are now drawn out, the carriage and movable plate are run back, the casting is knocked out of the movable die block and is placed in the pan of castings, and the operation commences again. Two men operating one machine can produce four or five hundred castings in a day. If the part is small, several separate cavities may be sunk in one die and gated together, greatly increasing production.

Due to the pressure on the metal, the castings come from the machine with a fin at the parting line, and the gate is also attached to the casting. From the casting department the pans of castings go to the cleaning department where this fin and gate are removed in a single punch press operation. The result is a smooth, clean casting, accurate to the thousandth of an inch.

Often castings of the most intricate design are produced in a single operation. Fig. 9 gives some aluminum die-castings which are the gas and spark control quadrant and instrument plate on the Marmon automobile, the Perry auto-lock housing and a switch box. Fig. 10 gives some examples of die-cast gears.

Chipping and Filing the Teeth of Gear Wheels

By J. T. Towlson
London, England

There are many factories in England that have for years made use of large gears, both spur and bevel, for their main power transmission units, and it is no uncommon sight to see a pair of such gears anywhere up to 9 ft. in diameter by 8 in. face in every-day service. It is the usual custom to employ a gear with cast teeth as the driver, running with what is called a "mortise wheel" as the driven gear, the latter having teeth of hornbeam, sycamore or apple-wood wedged or mortised into pockets in the cast iron rim.

Forty years ago there were no automatic gear cutting machines for cutting and shaping the teeth of such gears as there are today, and the job of "pitching and trimming," as it was then called, was done with hammer, cold-chisel and file, calling for a high degree of craftsmanship. Now, the teeth of such gears, both metal and wooden teeth, are cut upon a machine that takes over all responsibility and, once set, can be run by anybody. Then, only the best workmen in the shop could do the work at all.

While I must admit that the advent of the automatic gear cutting machine is a distinct evidence of progress, still one can hardly blame the old-timer for a sigh of regret that its coming has robbed our trade of much of the skill of hand and eye that was once so great an asset, and I believe that if our boys could but be impressed with the value of that kind of skill, more of them would be eager to acquire it.

In preparation for the job of pitching and trimming, the wheel would be swung up in the lathe, bored, faced both sides, and the tops of the teeth turned to the correct outer diameter. While in the lathe two circles would be cut on each face, one at the pitch diameter and the other some arbitrary distance—as one inch—below t he outer diameter of the wheel being worked.

The wheel would then be placed on a home-made chuck, or circular table, provided with worm and worm gear drive and index plates. The "pitching" was the laying off of the tooth centers by means of this index and when it was finished, radial lines would be laid upon each face to intersect the circles above mentioned.

Pitches of 2 in., 2½ in., and 3 in. were commonly used, and templets for all regular tooth forms were part of the equipment of any well regulated shop where gears were made. Guided by the circles and the radial lines upon the faces, the templet would be laid upon each end of each tooth in turn and the form of the tooth scribed around it. This gave the workman an outline of the tooth at both ends to which to work.

Mandrel Manipulation

Wooden mandrels were used to hold the wheels for chipping and filing. If the gear was not over 30 in. in diameter the mandrel would be gripped in a vise, but for larger wheels cast iron "stools" were provided to which the mandrel would be clamped at a height that would be convenient for the workman and at the same time enable him to see clearly what he was about.

A mirror hung behind the gear in such a way as to reflect the rear end of the tooth enabled the workman to keep both outlines under observation at once and was of vast assistance to him as it saved him from the constant craning of his head that would otherwise be necessary to watch the rear outline. A strut of wood braced between the floor and a gear tooth resisted the blows of the hammer and the pressure of the file.

The making and tempering of chisels for the work was an important item in the old-time craftsman's art. A chisel must not be too heavy or too light—experience alone would guide him there—the beveled surfaces should be not quite flat and the edges should be slightly rounded. Hammers, too, were a detail to be looked after very carefully. Hammers and chisels were the expert workman's pets and were jealously guarded.

The Shaping Process

Having the wheel set up, the next step was to chip away the surplus metal at each end, working from the periphery down close, but not quite to, the outline. Midway of the length of each tooth a narrow band of metal was cut away, reducing the section at this point to as nearly as possible the correct shape, in which the workman had only his experience to guide him.

Having obtained an approximation of the tooth shape at three points, the metal could now be dressed off quite rapidly with the chisels, leaving the final shaping to be done with the file. If the workman was really proficient in the art he would get the section at the center about right the first time and thus set up an ideal condition for filing, as the tooth would be "low" at the center and the file would be guided by the higher points near the end and thus would have no tendency to rock.

The novice would need to use a straightedge constantly to see that the surface he was making remained square with the face of the wheel and was not rounding.

If there is one job above all others in our trade where "practice makes perfect" then this job of chipping and filing the teeth of gear wheels is that one. It is one that requires not only skill and judgment but physical endurance as well, for it is tedious and monotonous, and the filing of the hollow flank of an epicycloidal tooth is tiring to the muscles of the wrist.

How Were that Screw and Nut Fitted?

BY SANDY COPELAND

On page 333, Vol. 57, of *American Machinist*, Stephen McEvoy relates, under the title "Another Machinist Has Reminiscences," how he gave a badly fitted multiple-thread screw to an apparently self-satisfied apprentice with instructions to file and fit the screw to the nut; his confessed intention being to "take it out of the polished apprentice."

As the screw had already been cut and delivered as finished by a presumably capable workman I think we may safely assume that it was at least somewhere near the correct diameter. Indeed, Mr. McEvoy leads us to believe in his preceding statements that the reason the screw would not go into the nut was because of careless or faulty resetting for the successive threads, with the result that one or more of the threads did not bear the proper pitch relation to the others.

What I would like to know is: how did the apprentice make a *good* fit on *all* of the threads by cutting one or more of them deeper or wider, as the case may have been? Most of us *do* know "how easy it is to set the compound rest parallel," etc., etc.; what we do *not* know is how the stock that the apprentice took *off* from one side of a thread was put *on* to the other side in order to make that thread a good fit in the nut. Did he make a new screw?

What is the Best Method of Increasing Salaries?

BY JOHN MARK MAY

While the practice of employers regarding the increasing of their employees' wages from time to time as they become more proficient, or for various other reasons, may be of more value to the employer, seems to be quite generally allowed to drift along until the employee makes a formal request for an increase in pay.

It seems to the writer that the better way is for the employer to make any increase in pay that the business can afford and that the employee is justly entitled to have without such request. The increase should be given when it becomes evident that such increase is justified and for the following reasons:

The majority of employees do not like to ask for an increase in wages and are very likely to be dissatisfied for a considerable length of time before doing so and during such time they cannot give the best service of which they are capable.

Every employee would like to know just what his standing is with his employer and if the plan of increasing pay only at the time and to the extent asked for, is in vogue, the employee is in doubt about his standing until he has formally made a request for an increase in pay and, if he gets the increase asked for, is still in doubt whether the employer has increased him to what he considered his worth or whether his request might have been met had he made it greater.

To better prepare themselves with evidence of their worth, very often men before asking for an increase in pay feel out the situation in some way among their employers' competitors. This tends to make unrest and often encourages some bidding between competitors that they may or may not be aware of at the time and may occur whether the employee expects to leave his present place or not.

Some may contend that if any increase is asked for and not secured that no harm has been done, but it seems to the writer that in such an event there is a feeling of loss of confidence in the other felt by both the employer and the employee.

Automobiles on Railroad Tracks

BY JOSEPH HEWES

It is getting to be the practice on many railroads for officials on short inspecting trips to use automobiles fitted to run on the tracks.

The Dodge touring car shown in Fig. 1 is used as an inspection car on the Central of Georgia Railway, and it is said that no trouble is experienced in driving it at 60 miles an hour, at which speed it rides very smoothly. The front wheels run on a solid axle, and as the steering wheel to be seen is of no use except to carry the throttle and spark adjusting levers, it is locked in position.

The Hupmobile shown in Fig. 2 is used by the superintendent of the Georgia Division of the Seaboard Air

FIG. 1—INSPECTION CAR ON THE CENTRAL OF GEORGIA RAILWAY

Line Railway Co. The steering wheel has been removed from this car and the throttle and spark adjusting levers, as well as the speedometer and clock, have been placed in front of the driver on an inclined board or shelf built across the front of the car under the windshield. The part of the board in front of the seat next to that of the driver is provided with clips for holding time tables, blueprints and the like to be looked over while *en route*.

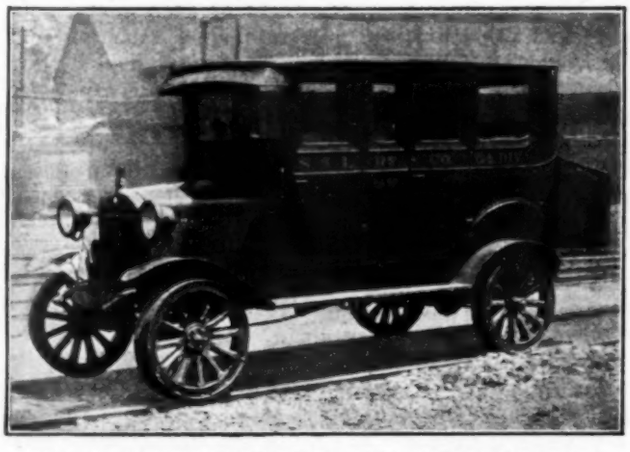


FIG. 2—SUPERINTENDENT'S CAR ON THE SEABOARD AIR LINE RAILWAY

Lowering Operating Costs in the Press Department

By C. E. STEVENS
Chief Engineer, White Sewing Machine Co.

Necessity for careful study of product—Reducing number of operations—Description of press tools used to facilitate operations and lower costs

TOO MUCH CANNOT be said about reducing manufacturing costs. Every department from office to shipping room has an unlimited amount of opportunities in which its costs can be reduced, and every man in the organization should be on the lookout for any chance to lower costs, no matter how little. In designing tools for production the possibility of combining operations is often overlooked. The designer responsible for the construction of tools should study the piece to be produced with the thought of combining operations or redesigning the piece or changing the material, so as to lower the cost or improve the quality.

This article deals with metal stampings, and will show some of the tools by which savings were made in press operations. A packing block used for holding a lever stationary when shipping a certain machine is shown in Fig. 1. This block has been made for years from a built up piece of wood—3/16 in. thick and cut out to a template on a band saw. The new block shown in Fig. 2 is made of heavy paper, or a cheap grade of fiber and cut out on a press.

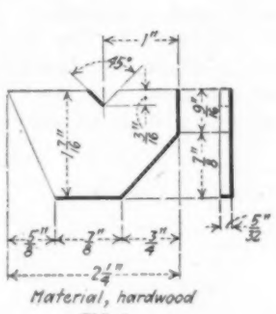


FIG. 1

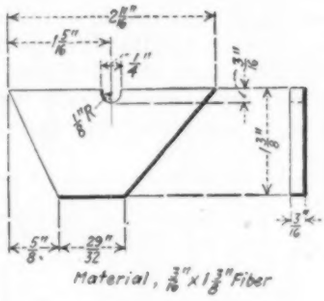


FIG. 2

FIG. 1—BLOCK FORMERLY MADE OF WOOD. FIG. 2—BLOCK AS NOW MADE OF FIBER

The tools used for making the fiber block are shown in Fig. 3. The die block *A* is hardened tool steel and is tapered 15 deg. on the back edge, 7 deg. on the front edge, and fits into a standard cast-iron die shoe as shown. A wedge *B* is used to hold the die in the shoe. The wedge is made of oil hardening tool steel and has 1½ deg. taper on its length and 7 deg. taper on each side, corresponding to the taper on the front of the die shoe.

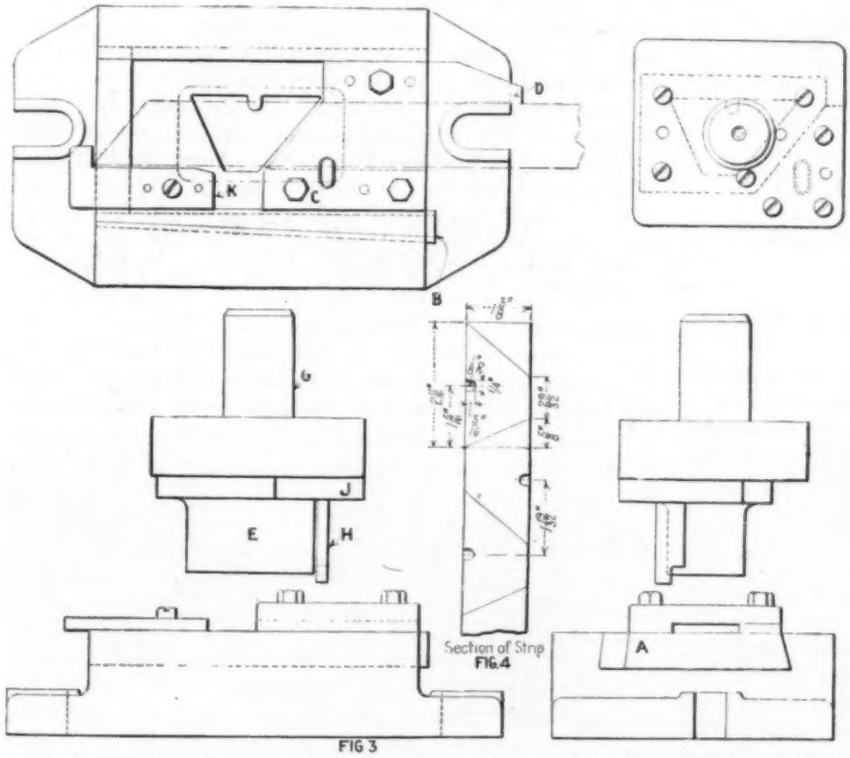


FIG 3

FIG.4

FIG. 3—TOOLS FOR MAKING THE FIBER BLOCK. FIG. 4—THE STRIP FROM WHICH THE FIBER BLOCKS WERE MADE

The stripper *C* is made of cold rolled steel and fastened to the die block with hex head cap screws and dowel pins, the rear cap screw and two dowels also holding the back gage *D*, which extends 2 in. beyond the edge of the die block. The blanking punch *E* is made with a shoulder and is fastened to the cast-iron punch holder *G*. The elongated punch *H* is made with a heel to keep it from crowding out when piercing the stock. This punch is set in the machine-steel punch pad *J*.

In feeding, the stock is held against back gage. The first position of stock is about 1/16 in. over the cutting edge of the die. The first stroke of the press blanks one piece and pierces an elongated slot. The stock is then fed to stop gage *K*, which is fastened to

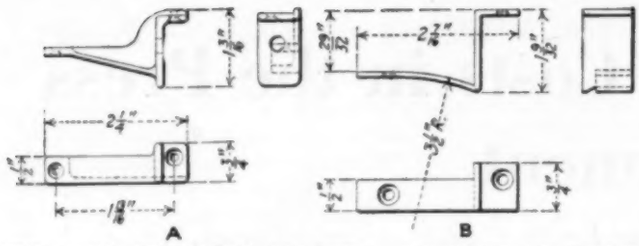


FIG. 5—(A) CAST-IRON BRACKET. (B) STEEL BRACKET

the die block with a flat head screw and two dowel pins. Each stroke of the press then produces two blanks, one passing through the die, while the other is cut off. A section of strip is shown in Fig. 4. The press is tipped at an angle of 45 deg. and the production is 224 blanks per minute.

A corner bracket which had formerly been made of cast iron is shown in Fig. 5 at *A*. This bracket was redesigned and made of sheet metal and is shown at *B;* the tools for the first operation are shown in Fig. 6. The die blocks *A* and *B* are milled to shape, as shown in plan view, and set in a cast-iron die shoe. On block *A* is mounted the stop gage *G*, which is made of cold

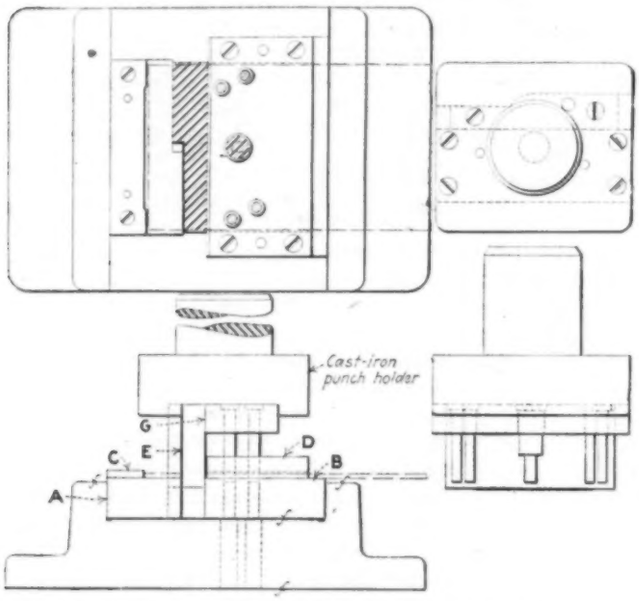


FIG. 6—FIRST OPERATION TOOLS FOR MAKING THE STEEL BRACKET

rolled steel cyanided and fastened by flat head screws and dowel pins.

Block *B* contains four round and one formed piercing hole. The stripper *D* is made of cold rolled steel and is fastened to the die block with fillister head screws and dowel pins, and which also hold the die block to the die shoe. The blanking punch *E* is fastened to the punch holders with fillister screws and one dowel pin. All the small punches are set in the machine-steel pad *G*, which is also fastened to the punch holder. In feeding, the first position of the stock is about 1/16 to ⅛ in. beyond the cutting edge of the die block. The first stroke of the press trims the rough edge and pierces five holes.

The stock is then fed to stop gage *C* and each stroke of the press then cuts two blanks, one passing through the opening and the other being blown out by air. The press is tipped at an angle of 45 deg. and produces 224 blanks per minute. The second operation is to form the bracket in the tools shown in Fig. 7. The punch and die blocks are made of tool steel, hardened and fastened to a cast-iron punch holder and die shoe. In operation the blank is placed in the nests shown in the plan view. The press is equipped with air which blows the blank from the die on the up stroke, eliminates the necessity of taking the formed part from the die and increases production considerably.

The latch shown in Fig. 8 was formerly produced in five operations. As four of these were forming

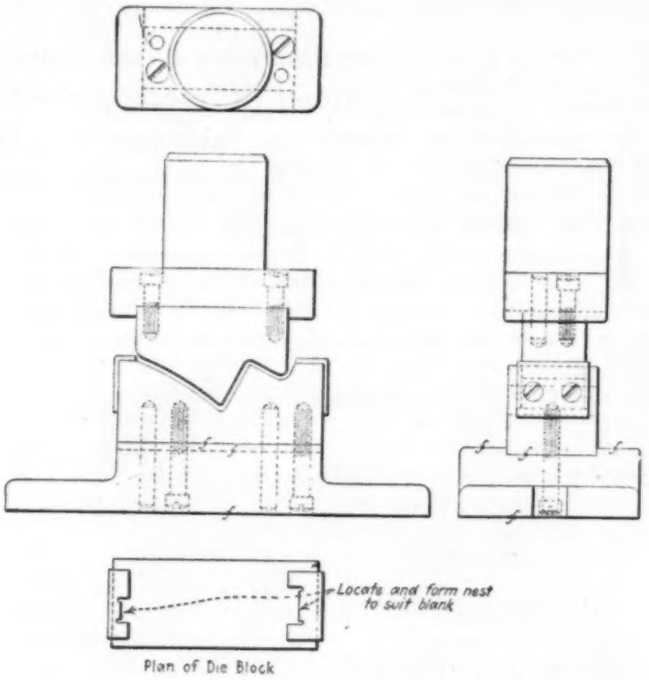


FIG. 7—SECOND OPERATION TOOLS FOR MAKING THE STEEL BRACKET

operations, it was necessary to handle each piece separately, which meant a large labor cost and considerable scrap. The tools were redesigned to complete the latch in two operations. In doing this the labor cost was reduced 70 per cent and a more accurate latch was obtained. The first operation was to form the ball cup, pierce and blank in the tools shown in Fig. 9. The tools were of the pillar type and gave correct alignment as well as reduced the set-up time to a minimum.

The die shoe *A* and punch holder *B* are of cast iron, held in alignment with liner pins *C*. These pins are hardened and ground, being a press fit in the die shoe, and a close sliding fit in the hardened bushings *D*. The bushings are a press fit in the punch holder. The die block *E* is made of tool steel, hardened and fastened

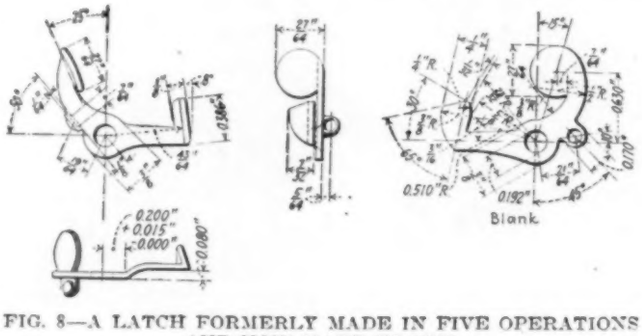


FIG. 8—A LATCH FORMERLY MADE IN FIVE OPERATIONS AND NOW MADE IN TWO

in the die shoe with fillister head screws from underneath. These screws help to hold the die block in place when grinding, as it is taken out of the shoe only when absolutely necessary. As it was necessary that the pierced hole in the latch be held to a given size and, as the size of the holes in blanking and piercing dies of the progressive type increase with grinding, the piercing hole was bushed, which made it possible to restore the size by putting in a new bushing.

The stripper *G* is machine steel, cut out to receive punches, automatic finger *J* and the three stop fingers *K*. and all the punches are set in the machine-steel punch-pad *S*, which is fastened to the punch holder by fillister head screws and dowel pins. In operation the stock is held against the back gage *H* and fed into stop *T*, which is held in by the operator, a small coil spring holding it out when not being used. The first stroke of the press forms the small ball cup. The stock is then fed to stop *V*, when the center hole is pierced. In moving the stock to *W* a part of a blank is produced. After the third stroke, the stock is fed to finger *J*, and the operator is then able to let the press run continu-

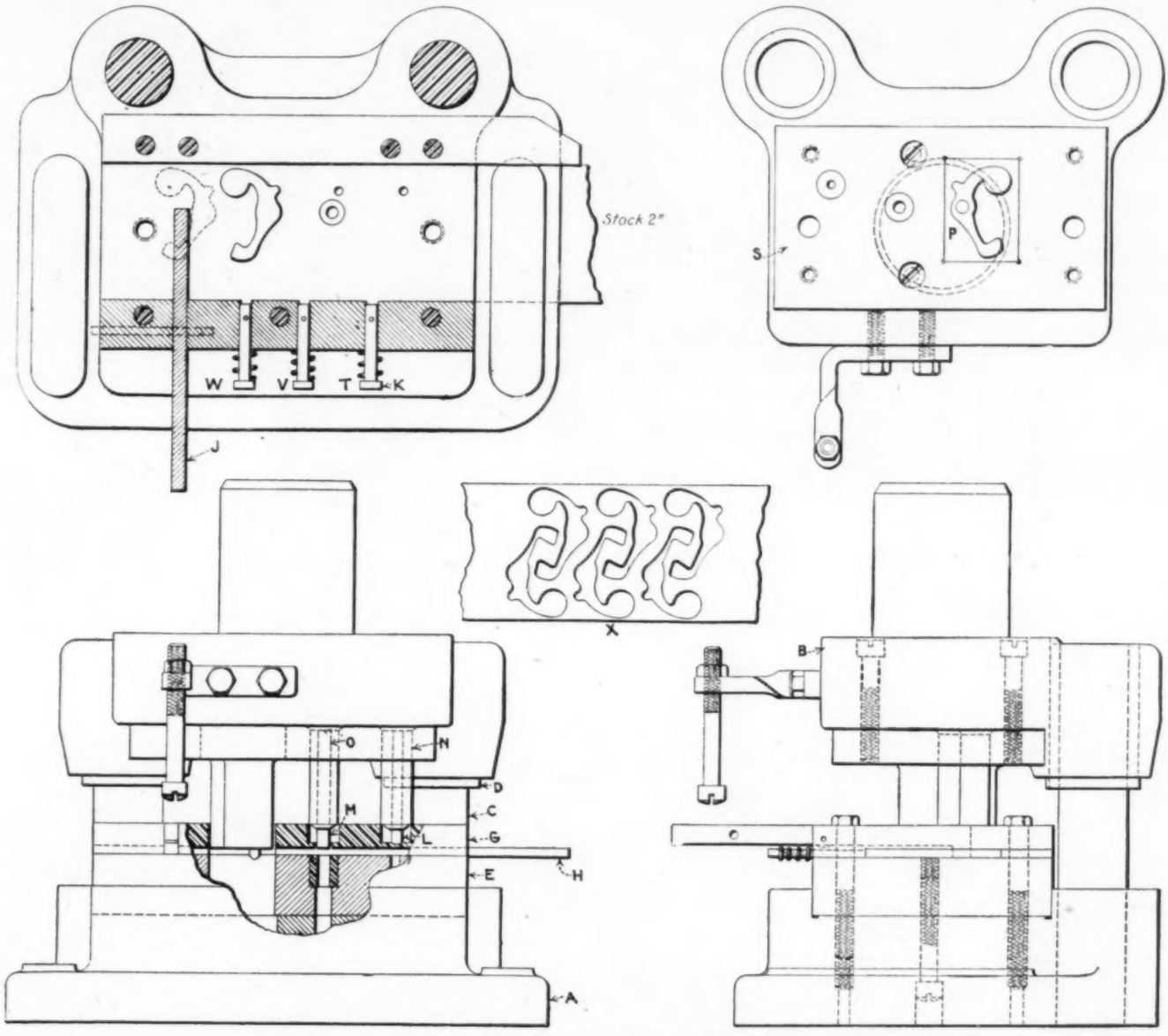


FIG. 9—FIRST OPERATION TOOLS FOR MAKING THE LATCH

The forming punch *L* and piercing punch *M* are made of standard size drill rod and supported by sleeves *N* and *O*. By using punches of this type very little bending or breaking is experienced. Another feature is the replacement. A new punch can be put in without disturbing the sleeve, which assures proper alingment at all times. When the sleeves protrude too far, due to grinding away of the blanking punch, they can be made shorter by grinding without taking them from the pad.

The blanking punch *P* is made with a square shoulder, ously until the entire strip is blanked. The strip is reversed and run through the die the second time, interlacing the blanks. A section of the blanked strip is shown at *X*.

The second, or forming operation, is done in the tools shown in Fig. 10, which shows them in a closed position, also a plan view of the die. The die block *A* is made of tool steel, hardened and cut out for the domino or presser block *B*, which is formed to put the step form on the latch as shown in Fig. 8. The domino, or presser block, is hardened and is a slip fit in the die

block and contains the pilot *C*. The domino is brought to its normal position by three pins *D*, which are a sliding fit in the die shoe. These pins when flush with the bottom edge of the die shoe, bring the lowest step of the domino flush with top edge of the die. The four pressure springs, which act on the pressure pad are held in place by the rods *G*. The construction can readily be understood from the illustration.

The forming punch *H* is made of tool steel and fastened to the cast-iron punch holder *J* by shoulder screws. The punch has a travel of about 3/16 in. and is held in place by a fillister head screw. This punch is a slip fit in and is a trifle longer than punch *H*. Fig. 12 shows the tools in the open position.

In operating the tools the blank is placed on pilot *C*, Fig. 10, and in the nest *L* fastened to the die block as shown in the plan view in the same figure.

The first action of the punch is to form the step in the blank. The pressure of the upper springs must be great enough to make this form. As the punch descends, the upper springs recede, allowing punch *K*, Fig. 12, to form the lip containing the ball cup over the domino *B*. At this position punch *H* is solid against the punch holder and as the punch enters the die the blank is brought to the desired shape. After forming, the part is brought from the die by the pressure of the lower springs. This die has proved very satisfactory and produces accurately formed parts.

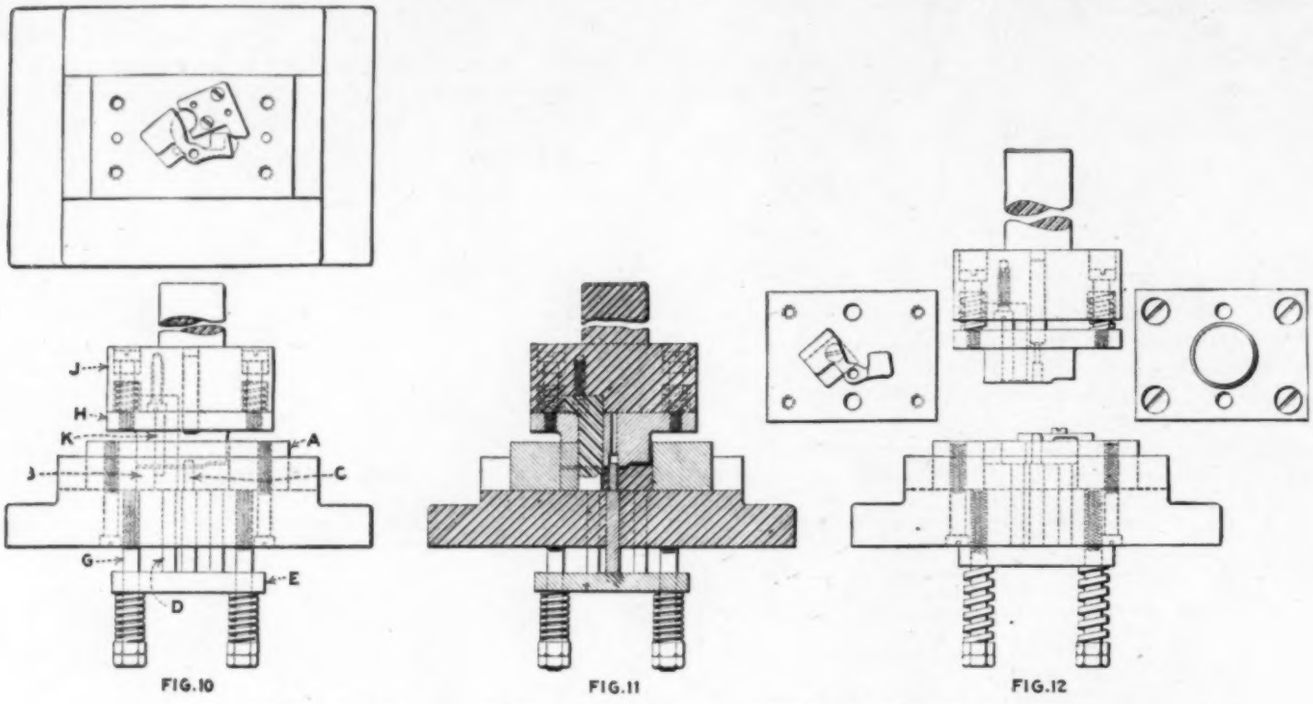


FIG. 10 FIG. 11 FIG. 12

FIGS. 10, 11 AND 12—SECOND OPERATION TOOLS FOR MAKING THE LATCH

Cutting Oils vs. Soap Water—Discussion

BY G. E. HODGES

I believe the editorial under the above title on page 705, Vol. 57 of the *American Machinist*, showed the way toward technical light on the subject of lubricants for cutting tools. There is, to the writer's mind, no single all-round lubricant for these tools.

However, I am a strong believer in the water compounds or emulsions, referred to by Mr. Egg in the same issue, where they can be used. The reason for this preference is that the compounds are as a rule cleaner to use, from the average operator's standpoint.

When shops have plenty to do, the labor is subdivided to mere operations, which even the greenest of men can be quickly taught. Show them a job where a heavy greasy oil is used and they are dissatisfied from the start. This is the cause of ninety per cent of the troubles of labor turnover in automatic screw-machine departments. A heavy oil is necessary here, because the cost of breaking a set-up is high when the tools have to be sharpened. The set-up must be maintained and the practice everywhere is to use heavy oil to do it.

On operations, like broaching, where the cost of changing tools for sharpening is low, I am for the compound. When the operator sees that the compound provided is not so bad to use from the viewpoint of cleanliness, he is more apt to be contented with his lot.

Should any research body or institute attempt the study outlined in your editorial, the question of desirability to the operator should be a factor in determining the actual costs in its summary.

Tools used in such a study should be carefully ground to the standard practice for their usage, as proper grinding of the tool is just as vital as is the lubricant in arriving at comparative costs.

The larger refiners of lubricants for cutting tools are constantly testing and compounding for various qualities in their products. Some of these products are really good and there is little chance for choice between them. If Mr. Egg will keep away from the heavier dark oils except where they are absolutely necessary and use the water compounds as far as possible he need have little fear of excessive production costs.

Where the German Exporter of Electrical Machinery Is Meeting His Match

BY HENRY OBERMEYER AND ARTHUR L. GREENE

Conditions favoring the Belgian electrical manufacturer—Expansion of one company after the war—Its chances in domestic and foreign markets

IT IS INDEED an ill wind that blows no one any good. Even the great war, the most destructive hurricane that has ever blown across the world, managed to deposit a few seeds of hope here and there, and a few of these seeds happened to fall in the backyard of the electrical machine manufacturer of Belgium. From these seeds has sprouted the determination to capture finally and for all time at least a major part of the electrical machinery market in Belgium, which, as it existed in 1914, was almost a German monopoly.

Ways and means to accomplish this end were freely discussed during a recent visit of the writers to the big factory of the Ateliers de Constructions Electriques de Charleroi, located a few miles south of Brussels. Those in charge of the company declared that Belgium could and would make a serious effort to free itself from dependence in this field on foreign nations who, before the war, supplied more than sixty per cent of all the electrical machines used in the country. As part of its plan the factory at Charleroi has been extended to a size nearly twice as great as that of eight years ago. In spite of momentary industrial depression it is working within seventy per cent of normal, making hay while the sun of German impotency continues to shine. Meanwhile, nations like the United States and Sweden are looming up as rivals in the place of Germany.

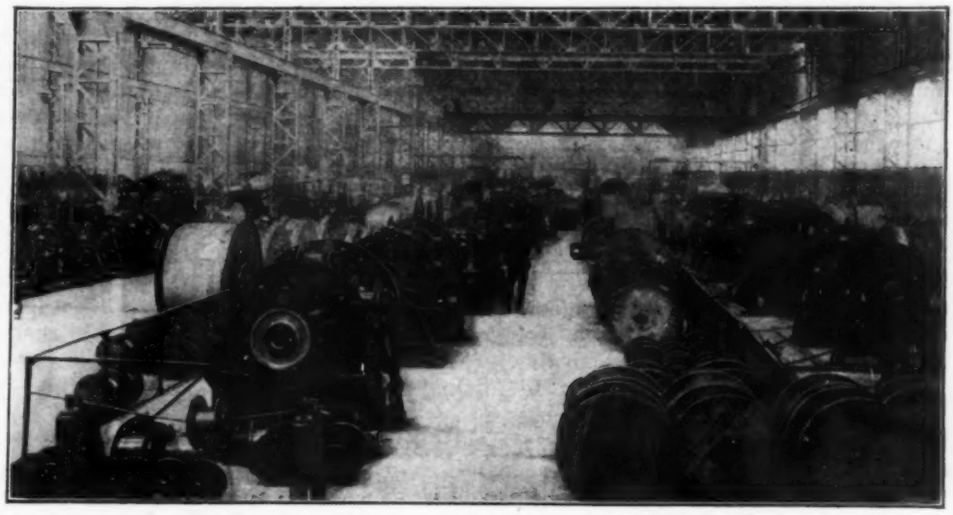


FIG. 1—CABLE SHOP OF THE ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI BEFORE THE WAR

In order to appreciate what factories like that at Charleroi are trying to do, it is necessary to realize something of the peculiar conditions surrounding that effort today. It is especially important to understand the spirit that lies behind it. In the first place, Belgium is comparatively prosperous. The significant word is "comparatively," for, of course, Belgium has sacrcely as yet begun to recover from the wounds of the war. No one crossing the border from France into Belgium, however, can fail to notice the marked difference in the apparent prosperity of the two countries. Much of this prosperity is only in seeming. Yet it is apparent in the faces of the people, in the clothes they wear, in the activity of the stores, in the efficiency of the police, and in the hum of the factories, all of which tell a truer story than many a row of figures.

Belgium, as regards its place in the present scale of continental European nations, is in a favored position. Its priority on reparations has aided immeasurably in its economic recovery. Even the German occupation itself was not an unmixed evil. Many Belgian fortunes were made during the war, some legally, some otherwise, in trading with the enemy who, far from his base of supplies, spent large sums of money when confiscation was unsuccessful or unfeasible. Over and above all this, however, was the determination of the Belgian people to begin work at once after the armistice instead of waiting for the payment of reparations which might never be paid.

The company at Charleroi naturally shares in these advantages. In addition it has others of its own which render it unique. It was particularly fortunate during the war, suffering comparatively little at the hand of the invader. The factory itself, of course, fell into enemy hands early in the conflict, but, for some reason known only to the German general staff, the direction of the company was left to the owners until as late as the spring of 1917. Exception was made in the case of a few shops which were used as repair stations for the German army. For nearly three years, therefore,

FIG. 2—CABLE SHOP TURNED INTO A REPAIR SHOP IMMEDIATELY AFTER GERMAN OCCUPATION

the company continued to manufacture tramcar motors, central lighting equipment and other non-contraband machines for the civil population. The Germans took formal possession in March, 1917.

In Figs. 1, 2, 3 and 4 are shown views of the cable shop of the company before and during the war, after the retreat and in its present state. Figs. 5 and 6 show the tube shop as it was previous to the war and also after the Germans had transformed it into a military office.

The factory was nearly as fortunate in the retreat as in the occupation. When the directors returned to the plant after the armistice, they found the factory almost completely stripped of its working machinery. Every machine in the cable plant, approximately 300, had been transported into Germany together with 250 machines from the machine shop. This condition, however, the company suffered in common with nearly all other factories in the invaded areas in accordance with the general plan of the German leaders, who hoped thereby to gain more advantageous terms at the peace conference. Charleroi's good fortune lay in the fact that it received back as much as 80 per cent of the stolen machines as the result of a special commission dispatched into Germany for that purpose. Of these machines, 90 per cent proved capable of salvaging, though not without considerable repairs. Half of the cost of this restoration, which totaled 15,000,000 fr. was borne by the Belgian Government, so that the company was able to resume operations within the year. Within two years it was working at prewar capacity. Rapid reconstruction at that time was particularly important because of the brief but extensive post-war boom in machines of all kinds, which lasted to the end of 1920 owing largely to the long dormant period in improvement projects among both municipalities and industrials which had preceded it. The effect of this period was particularly felt at Charleroi in the enormously increased demand, proportionately, for electrical machines on the part of public utility corporations in Belgium at that time.

Charleroi is and has been for the past four years, so far at least as Belgium is concerned, in an exceptionally good position to step into the shoes of such German companies as the Allgemeine Electricitaets Gesellschaft, of which the late and ill-fated Walter Rathenau was the head, and which for many years supplied the bulk of Belgium's electrical machinery.

The condition of Germany is well known, yet there are one or two factors, pointed out by those at Charleroi, which make it peculiarly bad; that is, favorable for Belgium. One of these is the 26 per cent export tax levied by the Allied governments on Germany to insure the payment of reparations. Another, and perhaps more important factor for the electrical machine manufacturer, is the inability of the German factory owner to compete with other nationals in buying copper on an open market. In the manufacture of electrical machinery in Europe it is estimated that from 40 to 50 per cent of the cost may be charged to labor. Here Germany's advantage is immensely superior to that of almost every other nation. In buying raw materials, however, she cannot possibly compete with other countries because of her depreciated currency.

In this connection it is only fair to call attention to figures recently made public by the New York Chamber of Commerce, which stated in statistics of Oct. 17 that Germany had received no less than 108,555,000 lb. of copper from the United States during the first six months of 1922, for which it was estimated, Germany must have paid approximately 100,000,000,000 marks. According to the *Chicago Tribune* dispatch, the cost of this copper is believed to have been paid for by huge credits built up through selling paper marks to American speculators in exchange. "The total copper imported from the United States by Germany this year,"

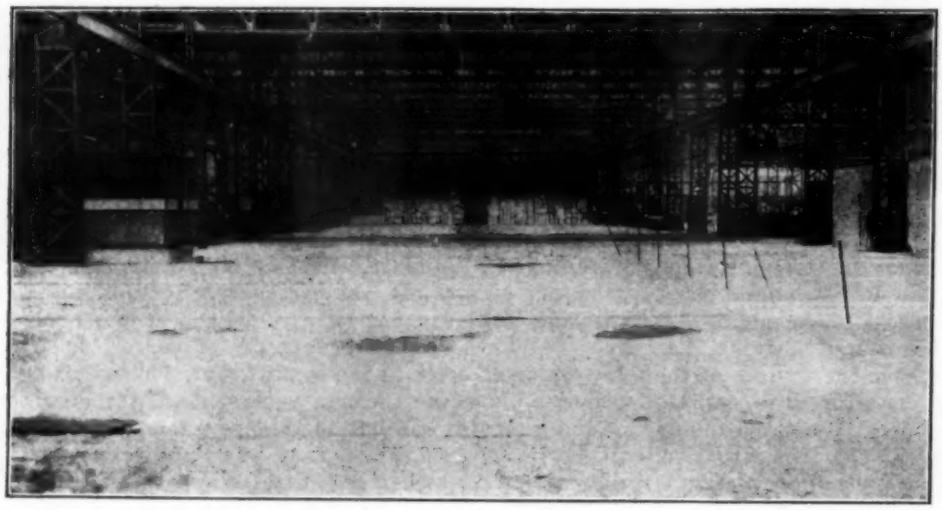


FIG. 3—HOW THE GERMANS LEFT THE CABLE SHOP AFTER THEIR RETREAT

says the Paris edition of the *Tribune*, "is larger than for any six month period since 1912, when the Reich was filling its war chest." (Many of these observations made at Charleroi regarding German competition, especially in the purchase of raw materials—though apparently repudiated by the New York Chamber of Commerce statistics—have been substantiated by German manufacturers with whom the writers have spoken since their arrival in Bremen.)

How much of this copper is finding its way into electrical machinery it is impossible to say. At the same time, it is evident that the price paid for the copper must be included in the final price of the machine. We can accept the word of the Belgian manufacturer that little of such machinery has found its way of late into Belgium.

FIG. 4—CABLE SHOP AS RECONSTRUCTED

As for the export tax, it is not generally regarded as having been effectively administered. Charleroi still feels the competition of such German firms as the Nord-Deutsche Electromotoren Werke of Hamburg and the Saxenswerke of Dresden who manufacture small motors and export them in large numbers. The bigger machines of the A.E.G., however, have been fairly well cut off. Such conditions, of course, are merely temporary, and it was generally admitted in Charleroi that the present is no time to judge of the potential rivalry of Germany. It should also be realized that these conditions apply chiefly to Belgium, and only to the electrical machine industry because of its use of copper on a large scale. Other countries, such as Holland, are seriously concerned with German competition at the present time. In the manufacture of other kinds of machines, Germany's low labor cost makes her a dangerous rival everywhere.

However, both Joseph Van Vliet, sales manager and chief engineer at Charleroi, and M. Klieviets, manager of the Antwerp office, are authorities for the estimate that Germany, who alone supplied 50 per cent of Belgium's electrical machinery before the war, now supplies probably less than 10 per cent. This 10 per cent, moreover, is chiefly in accessories or small motors of less than 50 horsepower.

The most critical period for the Belgian manufacturers, therefore, will be the next two or three years. One of three things will inevitably happen: Germany will have regained her dominance in the electrical machine market of Belgium; this market will have been transferred to some other country, such as France, England or the United States; or, as seems most likely, the Belgian manufacturer will have seized his opportunity to compete successfully at home with foreign interests. This is the point at which Charleroi begins to play its part. Recognizing the difficulties that hedge the way, Charleroi has sought to protect itself in two ways. The first is by extending its factories and the second by sounding out the possibilities of an increased export trade.

Charleroi, it should be remarked, has a tradition to maintain. Belgium's advent as a manufacturer of electrical machines on a large scale has been comparatively recent. It is said that the late King Leopold II was the first to chafe under his country's dependence on German manufacturers. At that time the factory of Charleroi, then only a fraction of its present size, was operating under the name of the Societe Electricite et Hydraulique. It was, however, fast going to the wall, and the king, so the story runs, realizing that the failure of this company would throw the country wholly at the mercy of Germany, hastily summoned a conference of bankers and instructed them to find measures to save the situation. The present organization of the company of Charleroi dates from that time.

In extending its works at the end of the war, therefore, Charleroi was only following out the implicit wishes of the late king. Encouraged by the industrial boom, then at its height, the company extended its cable

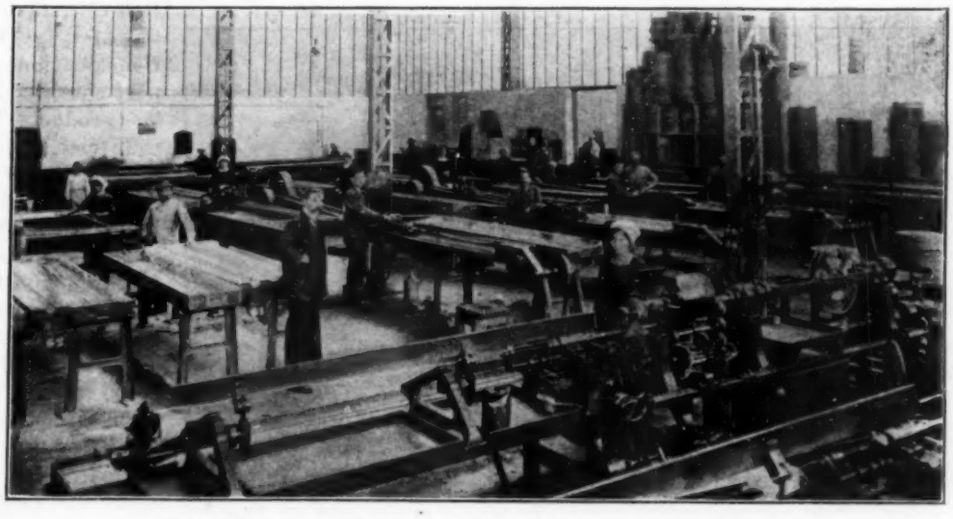


FIG. 5—TUBE SHOP OF THE COMPANY BEFORE THE WAR

FIG. 6—HOW THE TUBE SHOP WAS TRANSFORMED INTO GERMAN MILITARY OFFICES

plant by one-third and its largest machine shop by more than one-half. In addition it constructed an entirely new factory in the neighborhood of Brussels exclusively for the manufacture of small motors and electric signaling apparatus. Thus at the present time the company occupies a total of 58 hectares between Brussels and Charleroi, 45 hectares in Charleroi itself, divided between the "anciens ateliers" at Marcinelle which manufactures motors up to 100 hp., and the new machine plant and cable shop at La Villette, and the remaining 13 hectares at Ruysbroeck, along the railroad line from Brussels to Mons.

This extension cannot be illustrated better than by comparing the increase in its personnel. When the present organization was affected in 1904 slightly more than 500 workers were employed in the entire factory. By 1910 the number had risen to 1,300, and, at the beginning of the war, had very nearly reached the 2,500 mark. During the war, of course, it dropped down below even its original size. The truly significant figures, however, appear during the years following the war. By 1919 the personnel had nearly reached the number employed in 1914. The year following it jumped to 3,600 workers. Today it has nearly 4,500 employees, an increase of 80 per cent over its pre-war capacity. The determination of the company to achieve its aim, as well as the opportunity which will make that aim possible if anything can, is written in these figures.

Whether progress can be maintained in anything line that proportion is a question which Charleroi is probably not ready to answer. Here other factors enter in, and Charleroi is put in the position of having allayed one source of competition only to be confronted with another. Other countries including our own have not been slow in seeing the opportunity derived from Germany's temporary defection. Despite the adverse rate of exchange, according to those at Charleroi, the General Electric Co. of the United States, and the A. S. E. A. of Sweden are powerful competitors of the Belgian firms today, even in Belgium itself.

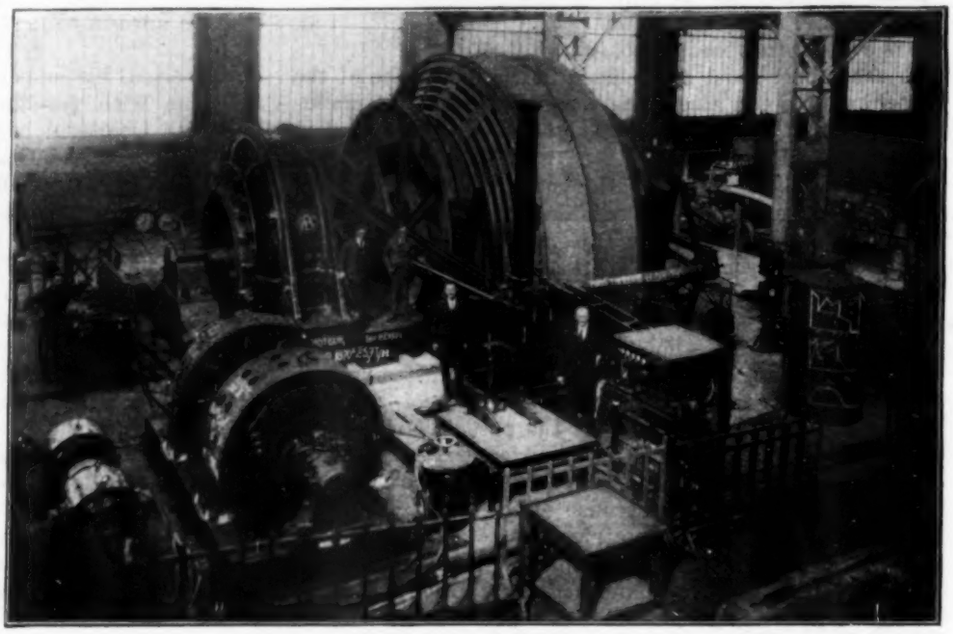


FIG. 7—EXHIBITION GROUP OF MOTORS AT THE ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI

For this reason Charleroi is again going beyond its former sphere to seek other markets beyond the seas. It is estimated that 25 per cent is a fair margin of safety. That is to say, if the Ateliers de Constructions Electriques de Charleroi can export continuously an average of 25 per cent of its products to Belgian colonies or foreign countries, it need not fear the immediate effects of foreign or domestic competition at home. Such a margin of safety is still a long way from being realized, for Charleroi exports today no more than 10 per cent of its manufactured machines, and these go mostly to Holland, South America and England. Charleroi recently filled some orders for mine machinery to China and Asia Minor, however, and is exceedingly optimistic over the future development of a greater South American market. In the Congo, too, with its large copper mines, comparatively few of which have been electrified up to date, there is a wide field for future expansion, especially for the Belgian factories.

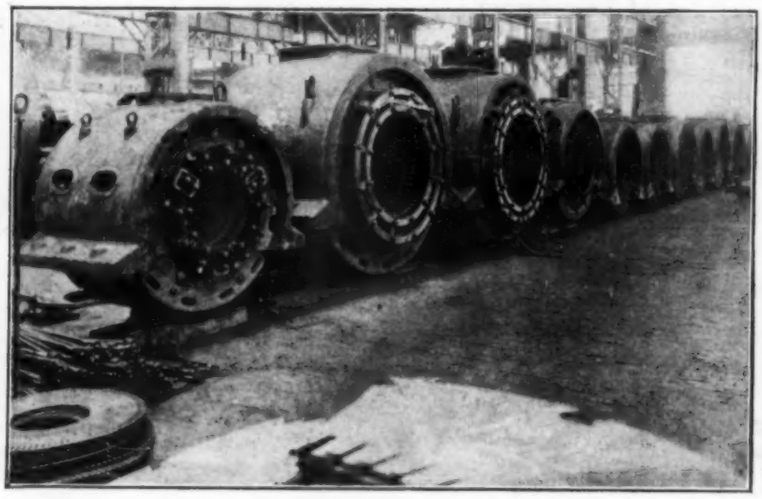


FIG. 8—AN ASSEMBLING SHOP VIEW

In the matter of England, Belgium finds itself in much the same relation as that of Germany to Belgium. While Belgium can undoubtedly obtain labor as much as 20 per cent cheaper than England, by the same token, the state of its exchange, it is at a disadvantage in buying copper on an open market. Nevertheless, electrical machines of Belgian manufacture are sold in England.

With an eye to its export trade, Charleroi is concentrating on the development of centrifugal pumps, especially of the multiple stage type, for use in mines. The pumps which the company recently sent to China and Asia Minor are of this type and are the latest in the field. The particular advantages are given as: automatic hydraulic balancing of the axial thrust; dismantling of internal parts from the delivery end; ease in dismantling and repair; and high suction lift of large quantities at high speeds without cavitation. The capacity of these pumps ranges from 1,100 gal. per minute at 1,460 r.p.m. to 1,000 gal. per minute at 2,950 r.p.m. The balancing of the axial thrust is effected automatically by hydraulic pressure in accordance with the company's British patent. Another important advantage is said to be the ease with which the pumps can be dismantled. For mine sinking and other similar work, Charleroi has designed a special type of vertical pump which differs from the others, however, only in the arrangement of the shaft and the lubrication system.

In the domestic market, of course, dynamos and motors for lighting and power are the most important. Many municipalities and companies in Belgium have only begun to electrify to any great extent, public utility corporations now taking fully 25 per cent of the factory's output, a great increase over the pre-war consumption. The demand has therefore suffered only slightly during the present depression. These machines are classified as: (1) Below 50 hp.; (2) up to 100 hp.; (3) all above 100 hp. Few recent improvements have been made here except in the second class. New models of these motors are enclosed and ventilation is provided by means of a fan keyed to the shaft which ensures the necessary air circulation. The motors can be made of the protected type by removing the end shield covers. In Fig. 7 is given an exhibition group of motors made by the company. Fig. 8 is a view of an erection bay.

There is also, incidentally, a constant demand for traction equipment. In addition to the old standard models, Charleroi also manufactures a series of forced ventilation motors which allow a maximum of power with a minimum of space and weight. In supplying equipment for tramcars the company collaborates with the Ohio Brass Co.

One of the reasons why Charleroi is able not only to maintain its pre-war standard, but even to extend both its market and its plant so appreciably is because the electric machine industry in general has suffered less from post-war uncertainty and depression than other machine manufacturers. When large electrification projects, lying dormant for the present, are revived with the general revival of trade, the producers of electric machines may experience a greater boom.

At least that is the expectation of Charleroi, where optimism is reflected in the fact that wages, which have suffered only a slight decline since 1920, are shortly to be advanced again. Confidence is expressed that Belgian manufacturers can keep German imports down somewhere near their present level and that they will be able to meet other foreign competition on its own ground. Their motto is "Belgium for the Belgians."

Historical Accuracy

By Harry Cornell

In closing his article "Repair Work in a Tennessee Railroad Shop" appearing on page 829, Vol. 57, of the *American Machinist*, S. Ashton Hand says: "It may be mentioned in passing that the Southern valve gear was originated in this shop."

Mr. Hand would have been correct had he stated: "The Charles Brown valve gear was rehashed in this shop." As much ink and paper have been devoted to telling readers just who invented the so-called Stephenson link motion, I am of the opinion that a high-grade publication like the *American Machinist* should have long ago informed its readers that the so-called Southern valve gear is, at base, the Charles Brown valve gear.

On page 271 of the October 1, 1880, issue of *Engineering* (London) Charles Brown, then managing director of the Swiss Locomotive and Machine Works, Winterthur, Switzerland, disclosed and described an outside valve gear for locomotives having an eccentric rod driven by a return crank and constrained at an intermediate point by a radius hanger sustained by a curved guide and with the free end of the eccentric rod in operative relation with a bell-crank.

On pages 599 and 600 of the June 18, 1910, issue of *Railway Review*, in my article "Locomotive Valve Gears," I directed attention of the reader to the Charles Brown article in *Engineering*.

Section 4,886 of the Revised Statutes of the United States of America provides for the granting of Letters Patent if the subject is not known by others and if the subject has not been described in a printed publication in this or any foreign country.

More than a year after I directed attention to Charles Brown's disclosure, William S. Brown of Knoxville, Tenn., filed a petition for U. S. Letters Patent (July 11, 1911) for the Appalachian rehash of Charles Brown's valve gear.

Really it would seem that one could obtain letters patent on one's Adam's apple if he were sufficiently skilled in the use of synonyms and able to avoid use of words describing "Old friends" of long standing.

Having been in a position to do so, it was my observation that this so-called Southern valve gear is more adversely affected by the flexing of the spring rigging than any other valve gear in use on locomotives.

I have before me a long letter written by the late Alfred W. Gibbs in 1907 in which he makes mention of the synchronous vibration set up in the Marshall valve gear, which gear is kinematically identical with the Brown valve gear.

Among certain types of the human family there is no subject that will so effectively arouse and quicken to action the inherent deviltry of man, as valve gear.

In conclusion it may be stated that the bell-crank with arms set at 72 deg. instead of 90 deg. is the old "bent rocker" idea and was embodied in the engines of the Italian warship "Etna" which have the Marshall valve gear. These engines were described in *Engineering*, Feb. 6 and 27, 1885. As the intermediate point in the eccentric rod moves farther from the central line of motion in one direction than the other in gears mentioned as Brown and Marshall gears, the arms of the rocker or bell crank are bent to compensate for the tendency to cause unequal valve travel past mid-position.

TABLE XVII

China—Imports of Machine Tools
(Value)

Country of Origin	1908 Haikwan Taels	1909 Haikwan Taels	1910 Haikwan Taels	1911 Haikwan Taels	1912 Haikwan Taels	1913 Haikwan Taels	1914 Haikwan Taels	1915 Haikwan Taels	1916 Haikwan Taels	1917 Haikwan Taels	1918 Haikwan Taels	1919 Haikwan Taels	1920 Haikwa Taelan
Hongkong	.....	.....	.....	341	2,699	.....	973	414	2,600	4,189	418	4,765	10,132
French Indo-China	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	.....
Singapore, Straits Settlements, etc	.....	.....	.....	.....	50	83	35	864	286	.....	500	2,929	360
Dutch East Indies	.....	.....	.....	.....	.....	.....	153	.....	205	.....	.....	.....	6,173
British India	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	559	.....	.....
Great Britain	785	40,183	5,530	9,699	5,726	12,112	24,040	9,052	10,772	1,254	2,598	50,477	111,038
Sweden	.....	.....	.....	.....	.....	.....	.....	2,777	958	.....	.....	.....	.....
Denmark	.....	.....	.....	.....	.....	3,855	1,549	1,164	.....	.....	.....	20,896	1,466
Germany	.....	.....	.....	5,513	6,285	15,169	21,208	.....	.....	.....	.....	.....	5,128
Belgium	.....	15,854	2,326	7,461	348	3,730	11,992	.....	.....	.....	.....	.....	1,500
Netherlands	.....	.....	.....	.....	.....	140	.....	.....	.....	.....	.....	.....	.....
France	.....	.....	.....	3,024	276	1,847	155	403	6,385	.....	.....	.....	1,257
Italy	.....	.....	.....	.....	.....	142	.....	.....	.....	.....	.....	.....	.....
Austria-Hungary	.....	.....	.....	.....	.....	203	.....	.....	.....	.....	.....	.....	.....
Russia	.....	.....	15,000	.....	.....	.....	.....	100	184	65	.....	650	.....
Korea (Chosen)	.....	.....	.....	6	.....	.....	.....	140	3,245	1,428	508	261	374
Japan (Including Formosa)	.....	.....	.....	1,067	4,112	10,234	25,771	42,094	49,740	160,475	198,954	221,996	316,636
Philippine Islands	.....	.....	.....	.....	.....	.....	35	101	.....	.....	.....	.....	1,229
Canada	.....	.....	.....	.....	.....	.....	214	.....	270	1,364	2,322	28,504	21,921
United States of America	.....	.....	.....	615	133	3,773	10,787	15,494	23,133	39,619	143,249	169,355	283,859
All Others	.....	.....	.....	.....	.....	.....	.....	208	.....	.....	.....	.....	.....
Direct Gross Import	785	56,037	22,856	27,726	19,629	51,288	96,912	72,811	97,778	208,394	349,108	499,853	761,073
Re-exported Abroad	.....	.....	1,080	288	1,390	834	839	2,629	35,105	32,587	17,705	8,657	5,792
Total Net Import	785	56,037	21,776	27,438	18,239	50,454	96,073	70,182	62,673	175,807	331,403	491,196	755,281

The Haikwan Tael had an annual average equivalent in United States currency as follows: 1908, $0.65; 1909, $0.63; 1910, $0.66; 1911, $0.65; 1912, $0.74; 1913, $0.73; 1914, $0.67; 1915, $0.62; 1916, $0.79; 1917, $1.03; 1918, $1.26; 1919, $1.34; 1920, $1.29.

TABLE XVIII

Union of South Africa—Imports of "Machine Tools"

Country	*1919	1920	1921
United Kingdom	£11,493	£10,384	£ 4,431
Canada	614	67	330
France	52	.....	.....
Germany	2	4	.....
Sweden	25	28	.....
Switzerland	1	.....	.....
United States of America	9,821	11,689	9,531
Total	£22,008	£22,172	£14,292

*Included with "mechanics' tools" prior to 1919.
(No exports shown for this class of machinery.)

TABLE XIX

Canada—Imports of *"Machine Drills and Power Lathes"

Country of Origin	1919–20	1920–21
Machine Drills		
United Kingdom	$ 9,997	$ 28,712
United States	268,134	204,646
Lathes, Power		
United Kingdom	1,867	3,883
United States	203,866	149,118
Total	$483,864	$386,449

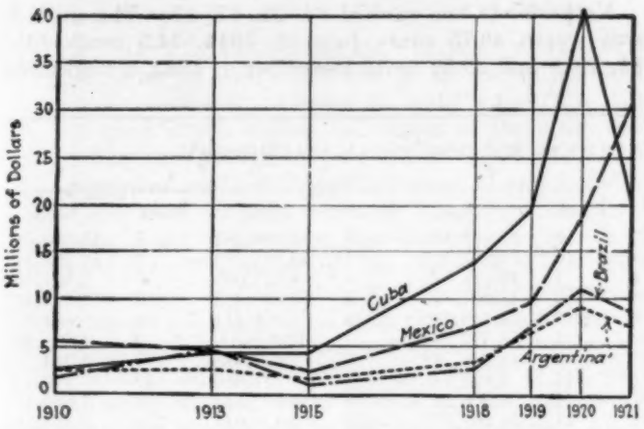
*These classifications are not shown prior to the fiscal year ending March 31st, 1922.

Machinery Export Markets for the Coming Year

By W. H. RASTALL
Industrial Machinery Division Department of Commerce

IN THE machinery trade 1923 promises to be a year of exceptional opportunity for the export manager, butin making his plans he should carefully analyze the whole field and devote his energies to the expanding markets as never before.

In 1910, the United States exported $51,489,598 worth of industrial machinery. In 1921, this had expanded to $246,436,364. Export business has become five times as important to the machinery producer as it was a



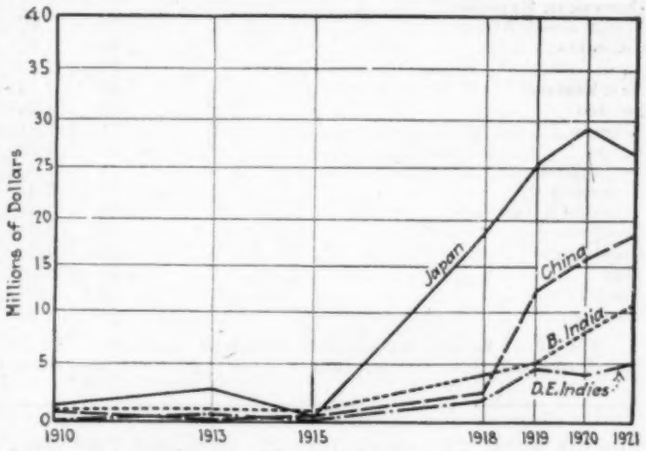
VALUE OF EXPORTS OF MACHINERY FROM THE UNITED STATES TO LATIN AMERICA IN VARIOUS YEARS

decade ago, as the average shop exports nearly 20 per cent of its product, a ratio that is rising very rapidly. Shops as far west as Wisconsin, that produce heavy machinery exclusively, have exported as much as 60 per cent of their total production. American engineering equipment is now going to practically every country in the world in rapidly increasing quantities, and the export department should arrange to take advantage of the situation. The merit of American engineering and American machinery has long been recognized in foreign countries, but events that have occurred since 1914 have given our equipment a definite prestige. Another result of the developments of recent years is the expansion of the world-wide demand for machinery. Most of the countries of the world are disposed to buy high-class machinery in larger quantities than heretofore. Also, European manufacturers are finding it difficult to conduct their businesses under present conditions. All these circumstances create a situation that offers the American machinery manufacturer an unusually favorable export opportunity.

In order that sales effort may be expended most effectively, the accompanying table is presented showing the thirty most important foreign markets arranged in the order of their importance, as shown by the volume of American machinery absorbed in 1921, but including data for 1919, 1913, and 1910, to show the nature of the changes that have take place. These data show clearly that Canada is our best foreign market, having ranked 2, 1, 1, 1 in 1921, 1919, 1913, and 1910, respectively. Mexico reached first place in 1921, but because of various disturbances ranked 1, 9, 4, 2, in this series of years. It will be noted that in 1921 there were 29 different countries that absorbed more than $1,000,000 worth of American machinery, a volume that justifies the sales manager in developing a carefully planned export campaign unless other factors, impossible to foresee, intervene.

During recent months the situation in Europe has discouraged certain of our manufacturers from making an active push for export business for in pre-war days our best machinery markets were in Europe. It will be noted, however, that in the first 20 countries mentioned in the accompanying table only 3 are in Europe, while the other 17 are largely free from the troubles resulting from the war. Nine of the first 15 countries have progressed to a point where the currency depreciation is less than 5 per cent. However, it is not the rate of exchange that makes business difficult but the fluctuations in exchange. In the above cases the fluctuations have all but disappeared, or at any rate the swings have become very narrow, and such changes as do develop are usually in a direction that promotes American export trade. Reconstruction has now reached a point where, for most countries, our position will continue to grow better.

The machinery export manager should also recognize the development that has taken place in many of these markets during the last decade, as shown by the data, in the table. For example, China took $260,431 worth of our machinery in 1913; but this had grown to $18,184,978 in 1921. Such development calls for very radical readjustment of sales plans. British India expanded from $628,063 in 1913 to $10,772,891 in 1921; Japan from $1,741,402 in 1910 to $20,941,408 in 1921; Mexico, Cuba, Brazil, Argentina, Peru, Chile, Philippines, Netherland East Indies, etc., etc., have shown remarkable expansion. This is supported further by the accompanying charts. All this information indi-



VALUE OF EXPORTS OF MACHINERY FROM THE UNITED STATES TO JAPAN, CHINA, BRITISH INDIA AND DUTCH EAST INDIES IN VARIOUS YEARS

cates clearly that there are splendid opportunities for the sale of Amercan machinery abroad and that it is not wise to pay too much attention to reports regarding Europe where the markets are contracting. It is far better to employ constructive sales effort in the markets that are expanding. In a later article further attention will be paid to the markets of Latin America and Asia. In the meantime the following brief statement may be useful:

Canada.—This has long been our best market for industrial machinery, and should show good results in 1923 as Canada is probably the most prosperous country in the world. Its exchange problems have disappeared. Plans have been prepared for important water-power

plants, paper mills, grain elevators, highway construction, and a large number of other operations, and it would appear that these will require a great deal of American machinery.

United Kingdom.—Exchange is now at a discount of less than five per cent and improving rapidly. On July 31, 1921, it stood at 375.25, a discount of about 22.8 per cent, so that there has been very creditable recovery. Many of the factories in England are in need of new labor-saving machinery, as the old equipment has not been adjusted to the present high-labor costs. Machinery of the old types required must be purchased in the United States as it has not yet been developed elsewhere. Also, it is felt in the United Kingdom that 1923 is to witness a boom in British trade. It would not be surprising if American machinery business showed great progress in England during this year.

France.—The franc was valued at 20.22 cents on July 30, 1914, 7.61 cents July 31, 1920 and 7.02 cents December 1, 1922. Although conditions are unsettled many very important engineering projects are to be developed and appropriate equipment will be required. This market may not show much expansion in 1923.

Australia as a market ranked 12, 16, 9, 8 in 1921, 1919, 1913, and 1910 respectively. The exchange rate is very much the same as for the United Kingdom. Readjustment has now advanced to a point where the Commonwealth can take up constructive problems, interrupted during the war, and work that is several years behind should now be brought down to date. A large number of projects are contemplated. New Zealand is in a somewhat similar position and there is a strong desire to industrialize both countries. In doing this they should use a great deal of American machinery.

South Africa has ranked 17, 19, 13, 12. A very large amount of American mining machinery is used there. Also, there is a growing demand for other classes of machinery. This territory gives promise of rapid development and American equipment is very popular there.

Spain has ranked 19, 18, 16, 25. The peseta was worth 19.6 cents July 30, 1914, 15.52 cents July 31, 1920 and 15.36 cents December 1, 1922. This market offers attractive prospects, but one gathers the impression that many of our manufacturers should improve their methods of handling Spanish business.

Egypt has ranked 23, 13, 31, 29, and exchange is no longer a serious consideration there. One gathers the impression that American machinery has never been properly represented in the Nile Valley and that constructive methods would be well repaid.

Netherlands has ranked 24, 22, 17, 17. The guilder was worth 40.75 cents July 30, 1914, 34.5 cents July 31, 1920 and 39.52 cents December 1, 1922, a negligible discount. Very closely associated are the markets of the Netherlands East Indies that ranked 13, 17, 25, 27, expanding from $84,448 in 1910 to $5,061,080 in 1921. This group will probably show a handsome expansion in response to proper sales effort.

COMPARATIVE VALUE OF THE FOREIGN MARKETS FOR AMERICAN MACHINERY

Country	1921 Rank	1921 Value	1919 Rank	1919 Value	1913 Rank	1913 Value	1910 Rank	1910 Value
Mexico	1	$30,784,076	9	$9,623,381	4	$4,998,262	2	$5,038,786
Canada	2	28,474,868	1	56,872,104	1	32,573,274	1	14,129,298
Cuba	3	21,307,814	5	19,618,436	6	4,125,049	5	2,40[illegible],592
Japan	4	20,941,408	4	25,021,786	8	3,314,435	10	1,741,402
China	5	18,184,978	7	12,149,039	28	260,431	15	641,732
United Kingdom	6	18,019,508	3	38,522,254	2	10,435,835	3	4,594,241
France	7	14,364,119	2	38,856,748	7	3,622,486	7	1,994,728
British India	8	10,772,891	15	4,822,136	22	628,063	19	516,438
Brazil	9	8,737,477	10	6,696,225	5	4,835,621	9	1,809,389
Argentina	10	8,007,785	11	6,407,357	10	2,428,017	6	2,168,565
Philippine Islands	11	5,529,555	8	10,007,110	11	1,489,836	18	532,361
Australia	12	5,510,167	16	4,604,588	9	2,999,321	8	1,877,985
Netherlands East Indies	13	5,061,080	17	4,546,249	25	424,314	27	84,448
Peru	14	3,770,184	20	3,045,582	19	755,004	21	255,666
Chile	15	3,561,510	12	5,652,134	14	1,085,599	14	703,270
Dominican Republic	16	3,252,954	24	1,069,168	18	884,377	22	254,995
British South Africa	17	2,907,183	19	3,208,622	13	1,177,207	12	1,177,324
Colombia	18	2,729,690	25	752,320	21	632,868	24	229,598
Spain	19	2,505,039	18	4,005,721	16	929,450	25	228,459
New Zealand	20	2,144,897	23	1,078,195	23	508,644	20	305,487
Sweden	21	1,957,928	21	2,210,253	24	497,260	23	254,652
Belgium	22	1,836,167	14	5,147,196	12	1,340,345	13	711,388
Egypt	23	1,733,625	13	5,173,893	31	69,753	29	46,011
Netherlands	24	1,600,471	22	1,854,492	17	925,361	17	593,925
Venezuela	25	1,422,439	29	571,365	26	388,100	26	110,680
Trinidad & Tobago	26	1,385,920	30	237,777	30	109,293	31	.....
Rumania	27	1,311,582	28	639,037	27	296,303	30	23,880
Honduras	28	1,249,762	31	248,934	29	120,529	28	63,991
Italy	29	1,054,653	6	12,250,311	15	931,383	16	604,794
Panama	30	982,941	26	761,668	20	722,946	11	1,325,523
Germany	31	628,893	27	655,300	3	5,259,454	4	3,177,648

The above returns include only industrial machinery. In 1921, no other country absorbed as much as a million dollars' worth of American machinery. Certain countries not here shown may have absorbed more equipment than Honduras in 1919, Egypt in 1913, etc.

Contraction and Shrinkage of Aluminum Alloys

As the result of an investigation of the contraction and shrinkage of aluminum alloys conducted by Robert J. Anderson, metallurgist, at the Pittsburgh, Pa., experiment station of the Bureau of Mines, it has been shown that contraction of a series of forty alloys varied from 0.96 and 1.80 per cent, depending upon conditions, and that it is advisable to make accurate pattern allowances for the various alloys in casting practice.

Oscillations and Fatigue of Springs

BY JOSEPH KAYE WOOD
Engineer, Western Electric Co., Inc., and A. T. & T. Co.

The third article—Internal friction as the chief cause of fatigue—Two resistances in hysteresis—Overstrain and its practical uses

IN THE PREVIOUS article, the wave motion or the behavior of every particle of an oscillating spring was considered, in order to make known the conditions upon which depend the values of the mode factor m. For the particular purpose at hand, we are not concerned directly with the behavior of every particle, but only with those particles in the immediate vicinity of the point where the load-deflection rate (l.d.r.) applies, which is usually at the free end of the spring. As the value of the mode factor must, however, be substituted for its symbol m in the period formula and as this factor may have several values, depending upon the number of the wave lengths formed by all of the particles, it was necessary to consider the wave motion.

A loaded spring which has not a very low l.d.r. is hard to start oscillating in the higher modes of frequency. For this reason, inasmuch as most springs are short and have attached to them relatively large loads, compared with their own effective weight, the fundamental value of the mode factor m may be used in spring design. As these m values have been determined in the previous article, the period for the fundamental mode will be assumed. In that case the wave motion will be dismissed from further consideration in this article. We will be concerned only with the motion of the particles where the l.d.r. applies. Furthermore, free or natural vibrations (such as a spring set in oscillation by one impulse and then left to itself), will be assumed, as in the other two articles, until the point is reached where impressed oscillations need to be discussed.

THE SPACE-TIME CURVE

If the l.d.r. point in an oscillating spring is given a uniform motion of translation in a direction at right angles to the amplitude, the space-time curve shown in Fig. 10 is traced. In the theoretical case where no damping or dying out of oscillation exists, this curve would be a pure sine wave similar to that shown in Fig. 11. The former curve and that shown in Fig. 12, which is a different type of damping, are often referred to as damped sine waves. Damping is due to all those resistances which act against the elastic forces that tend to sustain oscillation indefinitely.

The resistance which takes place within the spring material, appears to be accompanied by friction obeying the viscosity law, namely that the friction is proportional to the velocity. The external resistance is that due to air interference, "solid" friction, such as in leaf springs and guide rods, and in some cases to magnetic forces. The internal friction generates heat which represents a loss of strength to the material and is one of the chief causes contributing to fatigue failure. After a spring has been given an initial impulse (input of energy) which results in alternate transformations of this energy between the potential and kinetic states, it is only natural to expect that the oscillations should be destroyed (damped) because of

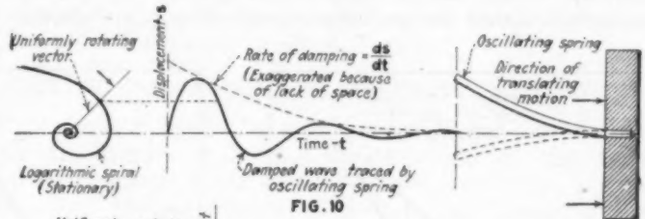


FIG. 10

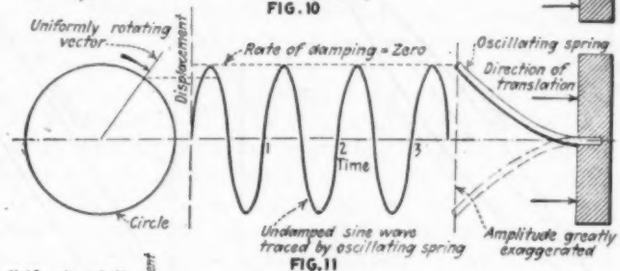


FIG. 11

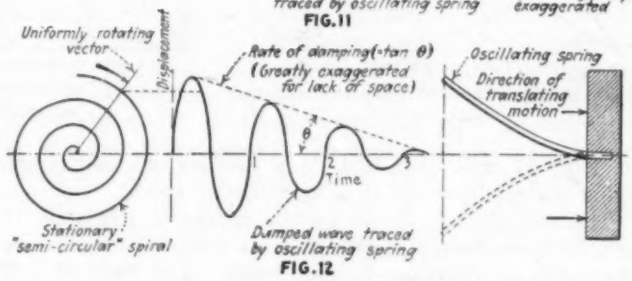


FIG. 12

FIG. 10—SPACE-TIME CURVE FOR VISCOSITY TYPE OF DAMPING
Only 2½ complete oscillations are given but actually many hundreds may occur.

FIG. 11—SPACE-TIME CURVE FOR UNDAMPED OSCILLATIONS

FIG. 12—SPACE-TIME CURVE FOR SOLID FRICTION TYPE OF DAMPING
Only three complete oscillations are given but actually several thousand may occur.

the gradual leakage of the input energy to the adjacent medium in the form of frictional heat and of local wave motions set up in the air. The space-time curve shows the characteristics of these different resistances which will be classified in the detail descriptions following, as internal resistance, external friction and air interference.

Internal friction probably takes place within those crystals which are most favorably situated for early plastic straining, before the proportional limit of the whole spring is reached, as is the case with freely

oscillating springs. Plastic strain in a crystal consists of slippage along gliding planes, the formation of which is resisted by the amorphous metal, an undercooled "liquid" of very high viscosity, surrounding the crystal, and also by that formed on the gliding planes themselves, due to the initial "solid" friction. The resistance or friction to intercrystalline slippage, therefore, very nearly obeys the ordinary viscosity law for liquids, namely, that the friction is proportional to the velocity of the motion which it opposes.

When damping of this type is small, as happens to be the case for spring metals, mathematical treatment shows that the period is very nearly constant and may be considered so for all practical purposes. Mathematics further shows on the same basis that the amplitudes decrease in geometric progression, that is, the ratio of two successive amplitudes, the logarithm of which is called the logarithmic decrement μ, is a constant. This fact is expressed graphically by the space-time curve shown in Fig. 10 which may be drawn readily by projecting the intersection of a uniformly rotating vector and a logarithmic spiral. It will be remembered that the undamped space-time curve shown in Fig. 11 was obtained in a similar manner when using a circle instead of a logarithmic spiral.

The dotted lines shown on the curves in Figs. 10, 11 and 12 were drawn merely for the purpose of showing the rates of decrease in amplitude. The rate at any elapsed time for the curve shown in Fig. 10 would be the tangent at that point. The rate for the undamped oscillation in Fig. 11 would be zero and for the one in Fig. 12 it would be constant.

As the period of oscillation is considered constant for the internal viscosity type of damping, the condition of isochroneous or simple harmonic motion is still maintained. Strictly speaking, the logarithmic decrement is inversely proportional to the period, although in so far as the practical use of the period formulas is concerned, this fact may be disregarded. It is of importance, however, in connection with the valuable discovery made by Lord Kelvin in his experiments on the torsional oscillations of a small wire. In these experiments it was found that when the torsional oscillations were made in a vacuum and under the right clamping conditions, so that external resistances and air interference were eliminated and only internal resistance had to be considered, the logarithmic decrement was not exactly inversely proportional to the period. His explanation was that a certain type of resistance known as elastic hysteresis was involved which included viscosity.

Hysteresis is best recognized by means of a stress-strain diagram representing both loading and unloading, as shown in Fig. 13. The loop shown is called the hysteresis loop. As the area under a stress-strain diagram is proportional to the energy put into a spring, this loop represents a loss in the strength of the material. For spring metals, the loop is so exceedingly small that the ordinary commercial testing machines cannot detect it. But many repetitions of stress will multiply this very small loss at localized points of weaknesses where the fatigue failure ultimately takes place.

The manner in which elastic hysteresis takes place might be described by continuing the previous discussion of the slippage of favorably situated crystals on their gliding planes. In the first place, the assigned meaning of the proportional limit which is determined by a static test necessarily of a relatively limited degree of accuracy, is that limiting stress below which the metal is deformed elastically, in direct proportion to the amount of the stress, and beyond which plastic deformation in the crystals takes place.

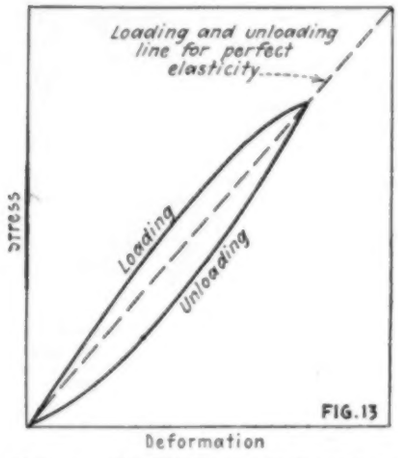


FIG. 13—HYSTERESIS LOOP GREATLY ENLARGED

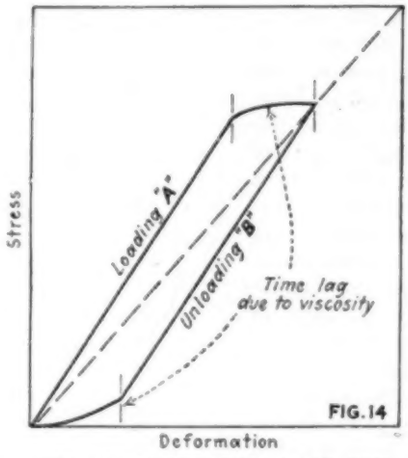


FIG. 14—HYSTERESIS LOOP DUE TO VISCOSITY ALONE

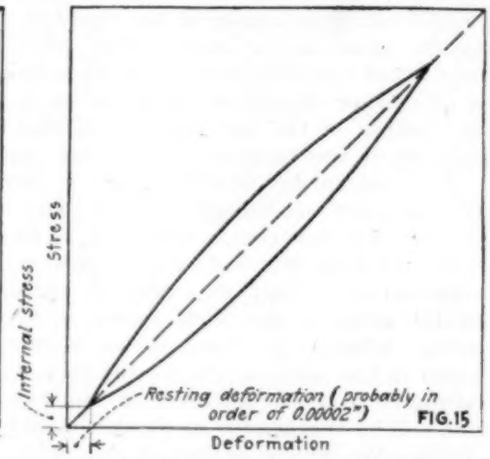


FIG. 15—HYSTERESIS LOOP DUE TO RESTING DEFORMATION ALONE

When the external load is removed, the elastic deformation is retroactive while the plastic deformation (slippage of crystals) is permanent. This understanding implies that none of the crystals start yielding to slippage below the proportional limit. But such is not the case as some crystals start to yield considerably before the main body of crystals. This property is due to the fact that the metal consists of a mixture of crystals which have different orientations and physical properties. Some of the crystals are initially strained either elastically or plastically while the latter straining sometimes amounts to a mechanical flaw.

These conditions are due to natural metallurgical causes, to manufacturing methods and to the practice of raising the proportional limit by developing metals which have a dispersion of hard crystals among softer and more ductile crystals. With the purpose in view of eliminating unlike crystals, and having moderately high proportional limits, the solid solution and eutectic types of metals were developed such as the very high nickel-chrome and pearlitic steels. Also in the production of metal piece parts, from the ore to the finished product greater care is being exercised to have the ultimate crystalline condition homogeneous and free from internal stress.

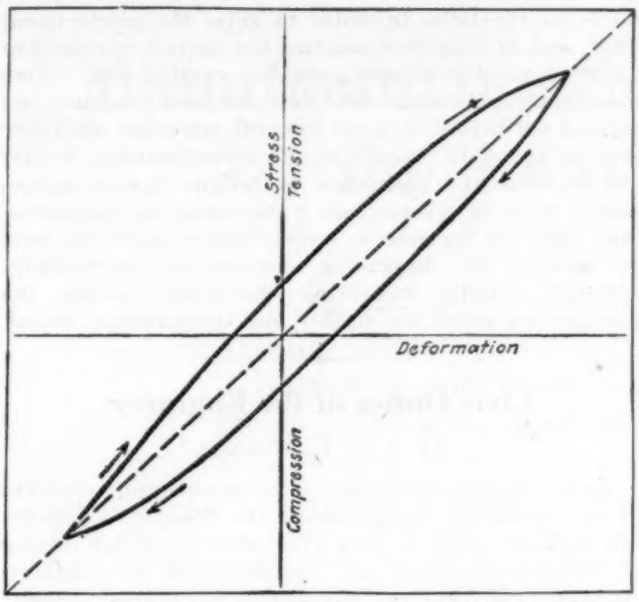


FIG. 16—HYSTERESIS LOOP OF INTERNAL DAMPING FOR COMPLETE OSCILLATION

But all of these conditions which cause early slippage cannot be eliminated entirely, hence the existence of a "true proportional limit" of a smaller value than the regular proportional limit, determined by the ordinary static testing machine. The elastic strain merges into the plastic strain very much like two adjacent colors in the solar spectrum, which is the reason why the testing machine of limited sensitivity cannot be used to measure the "true proportional limit." Practically, this is not a very serious difficulty, except in the case of fatigue and shock failures where it might be more economical and safer to know the "true limit" than to rely on a factor of safety which really amounts to a little more than guesswork. In the case of fatigue, however, certain practical and indestructive tests are being developed which are nearly as accurate as the long-drawn-out and repeated stress tests.

Suppose a single crystal is deformed by a stress just within its proportional limit. Upon removal of this stress the elastic deformation E would be reduced to zero. Then if a greater stress were to be applied so that the resulting deformation was $E + P$ the plastic part P would remain after the removal of the stress. In this process only a few slip planes probably are produced, and the "solid" friction in each case generates a small amount of heat, resulting in the formation of amorphous metal. The heat is quickly dissipated which increases the viscosity of the amorphous metal to such an extent that other weak planes develop. Now in a piece of metal we have thousands of these crystals each surrounded by a very thin layer of amorphous metal (liquid phase) which offers additional resistance to the continuance of slippage as is evident by the great many planes formed in an imbedded crystal for stresses well beyond the proportional limit.

Lord Kelvin first showed that a moderate tensile stress had a cooling effect and a compressive stress a heating effect, which seems logical because in the former case the pressure is decreased while in the latter it is increased. Thus in a ductile metal the resistance to slippage when a tensile stress is applied would be greater than when a compressive stress is applied because of the higher viscosity of the amorphous layers. This would account for the smaller ultimate change in lengthwise deformation when a ductile metal is under compression than when it is under a tension.

Rosenhain in his book, the "Introduction to Physical Metallurgy," shows that the viscosity of the amorphous metal surrounding gold crystals may be reduced to such an extent, by heating to very near the melting point, as to offer practically no resistance to slippage. In other words, a break between the crystals would occur before slippage had a chance to take place, which type of break usually occurs only in extremely brittle substances.

Such evidence points to the conclusion that elastic hysteresis must include the viscosity type of resistance. Thus, in Fig. 14 the stress-strain curve is given by the broken line when the loading is accomplished slowly as in a static test. When the loading is very rapid, the curve is given by line A, and the lag, often referred to as the after-effect, is due to viscosity. The line B is the unloading curve, and its shape is due to the same kind of resistance. In accordance with the preceding conclusion, it has been found that this characteristic lag does not occur in tungsten wire consisting of a chain of individual crystals.

Resting Deformation Besides Viscosity Resistance

As stated before, however, Lord Kelvin found that elastic hysteresis did not consist solely of this type of resistance. When early slippage takes place within the few favorably situated crystals, the action is not reversible due to the increase in the viscosity of amorphous metal on the gliding planes. These crystals are then in a position to be compressed when the external load is removed. Due to this compressive stress on a few crystals, or what amounts to the same thing, the tensile stress on the majority of the crystals, there is a resting deformation, probably in the order of 0.00002 in., the size of a step at the intersection of the gliding plane and the crystal boundary. (For further reference, see page 245 of Rosenhain's "Introduction to Physical Metallurgy.") This resting deformation is that corresponding to the internal stress referred to previously, which is developed in the material early in the history of the piece in question.

Alternating stress does not increase this deformation, but simply changes it from a plus to a minus value, the continual slippings ultimately opening up a

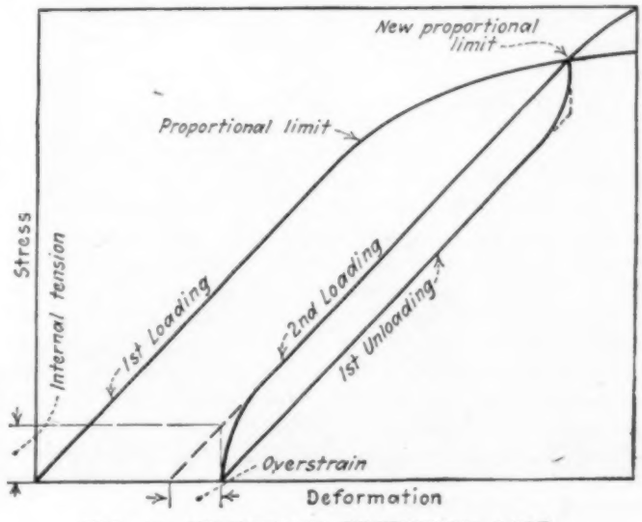


FIG. 17—OVERSTRAIN HYSTERESIS LOOP

flaw as a nucleus for fatigue failure. In alternating bending stresses, the Kelvin cooling effect due to tension in the crystals on the convex side very nearly counteracts the heating effect due to compression in the crystals on the concave side. But this effect takes place, presumably, in the amorphous metal of the crystal boundaries and is not concerned directly with slippage. The liberated heat due to slippage which occurs under both tension and compression, should cause a rapid rise in temperature starting at the "true proportional limit" or the first slippage. This is shown to be the case by the temperature rise in Stroymeyer's method of fatigue testing used so successfully in the fatigue investigation which is being conducted at the University of Illinois.

Flaws Develop into One Crack

On account of the resting deformation, the amplitude of an oscillating spring should decrease because during the second half oscillation the particular crystals in which the resting deformation exists, would reach their individual proportional limits very early as would also those crystals otherwise favorably situated for reverse stresses. Thus the slippage in a few crystals would continue back and forth until, in the case of damped oscillations, the amplitude reduced to zero, or in the case of millions of repetitions of stress, until flaws developed into one crack of appreciable size resulting in fatigue failure. The corresponding stress-strain curve for this phenomenon is theoretically drawn in Fig. 15. Its characteristic shape differs somewhat from the curve in Fig. 14 for the pure viscosity type of resistance. These two phenomena combined constitute the entire internal resistance part of damping in oscillating springs. The phenomenon represented by Fig. 14 is the cause of the discrepancy observed by Lord Kelvin in his experiments on the torsional oscillation of a small wire, referred to previously. Fig. 16 shows the composite curve of those in Figs. 14 and 15 for a complete oscillation, which curve may be called a graphical representation of the internal damping of springs.

Before passing on to the subject of external resistance, there will be inserted a word about overstrain which is similar to the resting deformation mentioned above except for being very much greater. When a spring is deflected well beyond the elastic limit the effect of the internal stress, which is very large in this case because so many crystals have had relatively early slippage, is plainly shown by the stress-strain diagram determined by a sensitive testing machine. That is, the curve would be somewhat similar to that shown in Fig. 15 and more exactly like that shown in Fig. 17. In either case the proportional elasticity would be destroyed differing only in degree.

The ordinary proportional limit and ultimate strength are apparently raised by overstrain, but that is only because an internal stress of appreciable magnitude has to be initially overcome by the external load. The dotted lines in Fig. 17 show how the internal stress and the pure elasticity of the metal combine to give the imperfect elastic curve and the fictitiously high proportional limit. Boiling (212 deg. F.) or low temperature annealing decreases the viscosity of the amorphous layers sufficiently to relieve this internal stress, while in some cases it only requires a sufficiently long time to relieve them (aging).

In practice, helical springs are overstrained when made on the lathe in order to raise the proportional limit, and in telephone practice flat contact springs are adjusted for the proper gaps by overstraining. This overstraining should not be overdone, because, as pointed out before, it tends towards imperfect elasticity and, as found in recent fatigue investigations, it does not increase the resistance to fatigue failure appreciably, while in severe cases it decreases the resistance. Such practice becomes a serious objection in the case of springs for measuring instruments, particularly sensitive length measuring machines, unless the springs are given the proper low temperature anneal.

Civic Duties of the Engineer

By J. A. L. Waddell

In an address delivered to the engineering students of the University of Barcelona, Dr. Waddell, a consulting engineer of New York City, made some interesting statements regarding the civic duties of the engineer. Although the engineer has begun to interest himself in politics and to make himself felt in this field, there is still much to be desired from those engaged in all classes of engineering work. The remarks to which we refer as as follows:

Every individual should pay proper attention to his duties as a citizen of the country in which he resides. Engineers in America are great sinners in this particular; and the result is that our profession has very little to say regarding the government of the country. In the Administration, the Senate, and the House of Representatives at Washington engineers are generally conspicuous by their absence. This is a condition that should be corrected as soon as possible, for the benefit not only of our profession but also of that of the country, because who is there so competent in thought and action as an engineer?

In European countries, I believe, engineers take a more prominent part in politics than they do in the U. S. A.—for instance, in Italy there are twenty-three engineers who are members of parliament. What the conditions in Spain are I do not know; but I notice that the Alcalde of Barcelona is a distinguished engineer.

Selling Machine Tools—Discussion

By Tom H. Blair

In an article under the above title by Entropy on page 854, Vol. 57, of the *American Machinist*, the attitude taken is that it is the customer's fault if he is charged too much for machine tools, due to so many salesmen calling on him and spending time with him.

A little instance of something that actually happened in our plant will perhaps change Entropy's ideas a little.

I read an advertisement in the *American Machinist* of milling machine equipment by a well known firm and in the ad it said, "we will be pleased to mail you Bulletin No. 52 upon request." The advertisement looked good to me and I had the clerk in the purchasing department write for it for me, with the result that a few days later our city office was visited by a salesman from the concern who brought the bulletin with him. Our letter was quite plain and asked only for the bulletin to be forwarded to us. Now under these circumstances is it fair that the customer should stand the expense of the salesman's trip? Personally I think a goodly number of concerns have too many salesmen. I believe there are two sides to the question of sales cost —the customer's and the salesman's.

Manufacturing Small Electric Motors for Suction Sweepers

By FRED H. COLVIN
Editor, *American Machinist*

Making armature and field cores — Winding armatures — Soldering commutator wires — Balancing armatures — Storage—Modern assembly methods and power conveyors

THE ILLUSTRATIONS which follow were taken at the Canton, Ohio, plant of the Hoover Suction Sweeper Co., and give a picture story of the way in which small motors are manufactured by modern methods. Many operations are, of course, omitted and attention is paid only to the points which are of special interest.

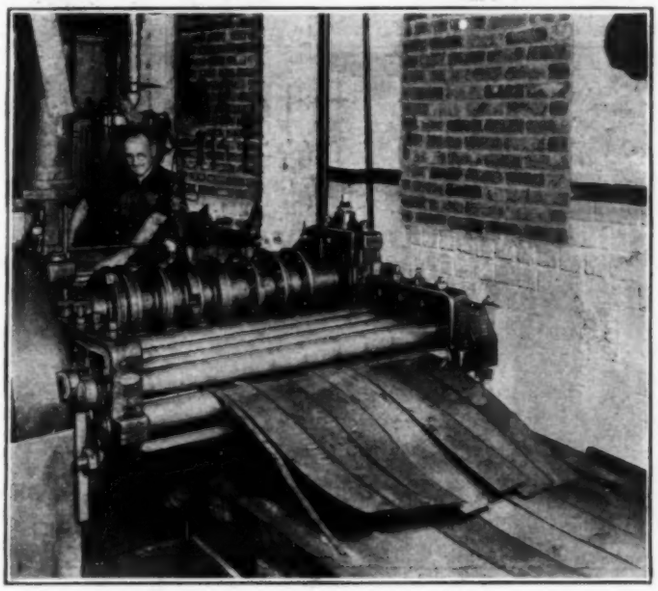


FIG. 1—SLITTING SHEETS FOR ARMATURES AND FIELDS.

Material for the armature and field cores is purchased in the sheet and slit into strips on the machine shown in Fig. 1. From here the strips go to the punch presses which blank out the laminations, as in Fig. 2. Both the armature and field cores come out of the holes shown in the strip, being separated by an ingenious method similar to the sorting of coal by allowing the smaller pieces to drop through openings while the larger pieces slide over.

The armature cores are pressed on the motor shaft as at *A*, Fig. 3, and the cores are then ready for winding in the small special machines shown at *B*. The armature is clamped at right angles with the shaft, leaving opposite slots open for winding. The guards C, make it easy to guide the wire into the proper slots as the armature revolves in front of the operator. The girls become remarkably skilled in handling this work.

The commutator segments are assembled in the usual manner and come to the operation shown in Fig. 4, mounted in the large rings at *A*. In this operation the sleeve or hub is forced into the segments. The component parts of a hub are shown at *B*, and are guided by the rings *C*, while being forced into place. A sufficient number of these rings is always available.

Assempling the armature and commutator is shown in Fig. 5, the commutator being forced on the armature shaft while the armature is held in the fixture shown under the arbor press. The wires are then connected and soldered in place with the aid of the soldering machine shown in Fig. 6. The commutator end of the armature is set into the opening and the melted solder is made to flow around the armature leads, just as the metal is made to flow in the mold in linotype or other die casting machines. The armature is allowed to remain in position until the solder has an opportunity to penetrate all openings. A thermometer enables the operator to know that the solder is at the right temperature at all times.

The commutator is turned on a Porter-Cable lathe as shown in Fig. 7. Electrical tests are made after each winding and connecting operation and after the armature is found to be O. K., it is baked and the bearing portions of the shaft are ground. The armatures are carefully balanced on the disks shown in

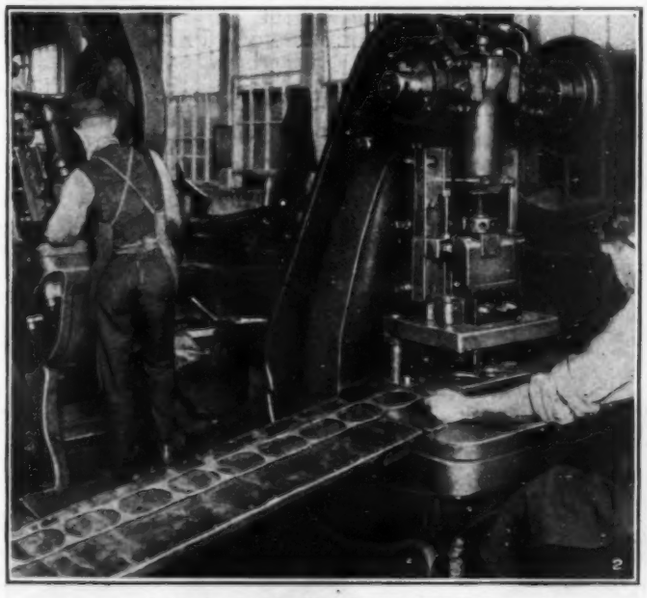


FIG. 2—PUNCHING THE STRIPS

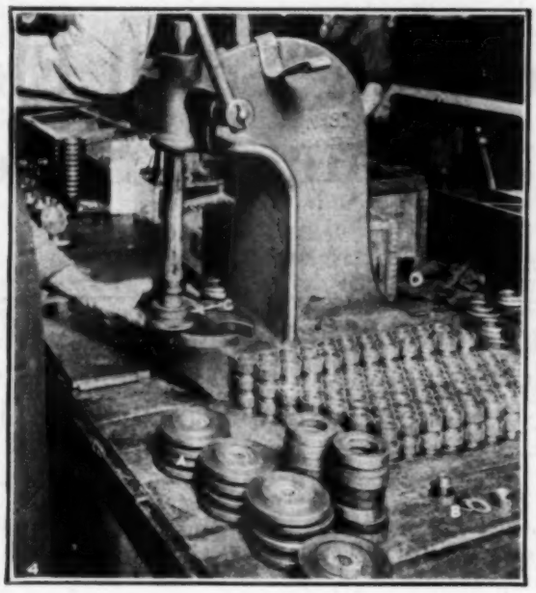
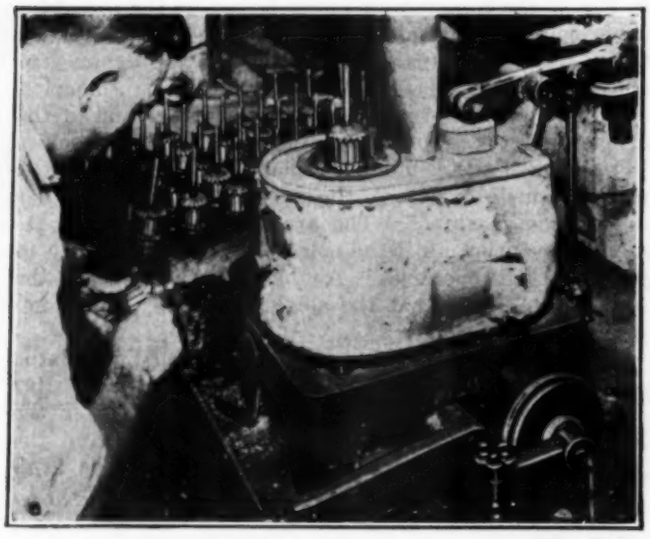


FIG. 3—WINDING THE ARMATURES. FIG. 4—ASSEMBLING COMMUTATORS AND BUSHINGS
FIG. 5—PUTTING COMMUTATORS ON SHAFTS



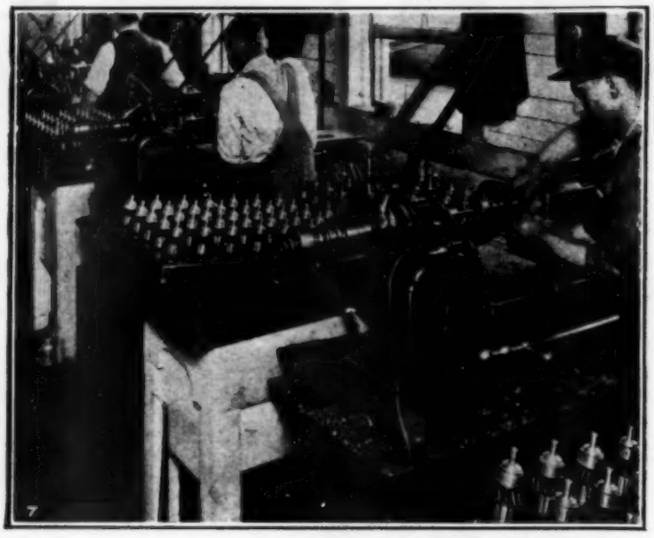


FIG. 6—SOLDERING MACHINE FOR COMMUTATORS. FIG. 7—TURNING COMMUTATORS

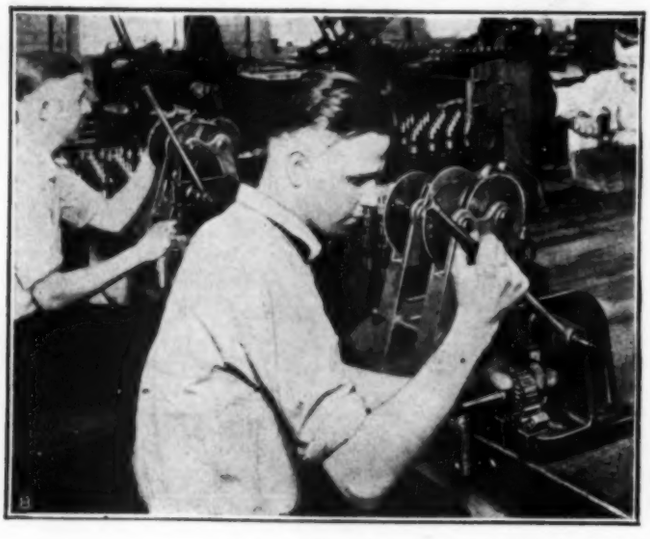


FIG. 8—BALANCING ARMATURES. FIG. 9—INSPECTING FOR CONCENTRICITY

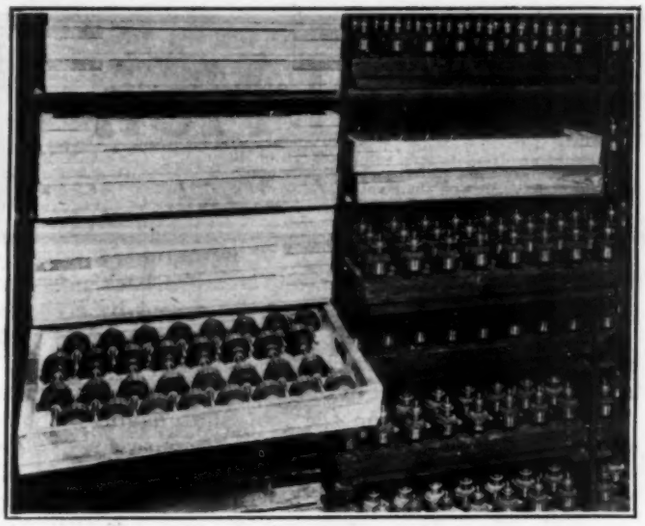


FIG. 10—TWO METHODS OF ARMATURE STORAGE

Fig. 8. After finding the light side of the armature, the winding on that side is pressed down and small pieces of non-magnetic metal are forced into the slot or slots, until balance is secured.

The completed armatures are then tested for concentricity as illustrated in Fig. 9, and are held within very close limits, after which they go to stores where they are kept in the trays to be seen in Fig. 10. This view shows two kinds of trays, the older type which held the armatures in an upright position, and the new type in which they are nested into close quarters, with each armature carefully supported and yet taking up much less vertical space than before. These new trays thoroughly protect the armatures and fit together so closely as to keep out dust. There are doubtless many places where this can be used to advantage.

The assembling methods and the layout of the assembling department, Fig. 11, are thoroughly modern and of special interest. Sixteen men can assemble over 2,000 motors per day of 10 hours. Each man has a separate bench which is conveniently arranged for his tools and all the parts needed in the assembly. The conveying system too, plays its part and is securing production. The various parts for a motor come to the assembler in a box by means of the upper conveyor belt. When he has completed a motor he puts it in the same box in which the parts were delivered to him and places it on the lower belt, taking a new job from the upper belt. Both the upper and lower conveying belts give continuous service and carry the completed motors to the testing department at the rear of the assembling room. The testers remove the motors from the boxes which are then placed on the inclined conveyor and go back to be filled with parts for other motors.

Completed motors are placed on trucks that are wired for current and are given a run of an hour while the trucks are on the way to the final inspection group shown in Fig. 12. This view shows the motors running on one of the trucks at *A*. From here they are removed for final inspection. The motors are then placed in a box and, by a gravity conveyor and tray lift, are taken to the first floor and discharged on a slat carrousel. The carrousel carries the boxes to the girls who connect the motor switches and sweeper cords. The box containing the wired motors is then placed on a belt conveyor and carried to a point where the motors are removed and loaded on special trucks for conveyance to the North Canton plant. The box is left on the conveyor and by means of the tray-lift and gravity conveyors, is carried back to the starting position on the second floor.

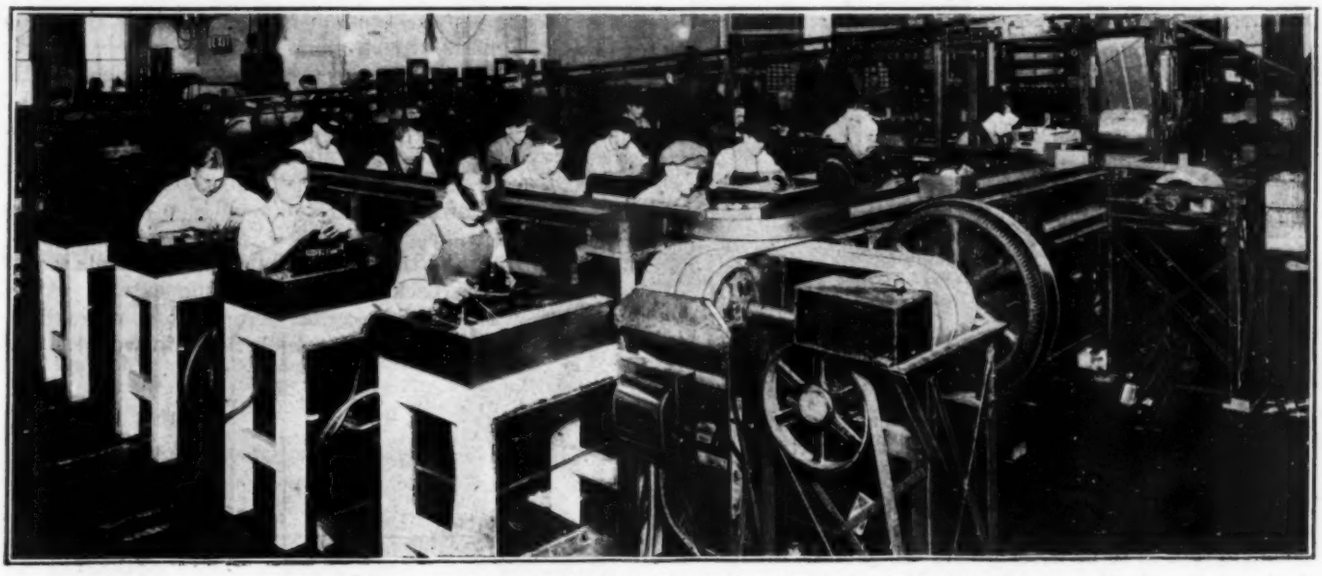


FIG. 11—THE MOTOR ASSEMBLING DEPARTMENT AND ITS CONVEYORS

FIG. 12—FINAL INSPECTION OF MOTORS

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Are Metal Workers Hidebound? —Discussion

BY FRANK W. CURTIS

The discussion of the above title by Alfred Herbert, Ltd., Coventry, England, on page 768, Vol. 57, of the *American Machinist*, stating that power consumption of

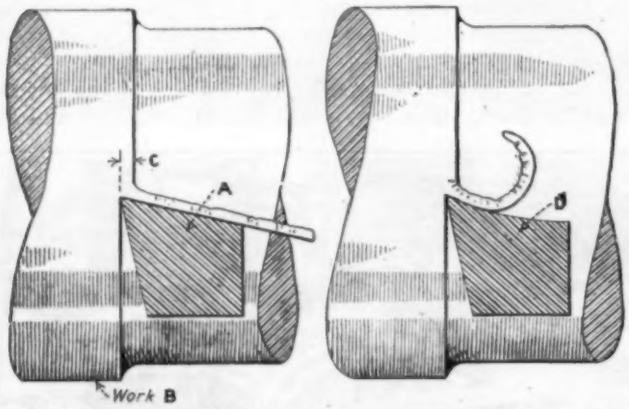


FIG. 1—ACTION OF CHIPS CUT WITH TOOLS HAVING FLAT AND HOLLOW TOP RAKE

metal cutting tools has not received sufficient attention amongst users of such tools, certainly brings out a subject which can stand unlimited criticism.

Tool grinding is perhaps the most important factor to consider, yet such details as speeds and feeds, position of tool to work, type and condition of machine tool and type of drive, must be borne in mind when horsepower consumption is to be determined. A good definition for tool grinding is the art of correctly grinding angles of cutting tools so they will hold up a sufficient length of time according to the nature of the work to be machined, produce the necessary finish and accuracy required, and remove more metal (or material to be cut) with a minimum amount of power. How many manufacturing plants are there that can claim correct tool grinding? Many shops have some machining operations "licked" in so far as tool grinding is concerned, but there is a good field for improvements which should be carefully investigated and the investment will be rapidly repaid by production.

It was stated in the previously mentioned discussion that a certain concern in England changed over their lathe tools from the ordinary type to a curved top face type, and a reduction of power consumption was evident. Perhaps this was due to the action of chip curling brought forth by the concave. Referring to Fig. 1, this may be clearly explained in a diagrammatical way: *A* represents a tool cutting a steel shaft *B* with a feed per revolution shown at *C*. This tool is ground straight on the top face (referred heretofore as the ordinary type) as shown and the action of the chip would be to rub over the entire surface of the tool which, in my estimation, would create a back pressure probably not great enough to notice except by a check-up of the current consumed. At *D* is shown a tool with a curved top face more commonly called "hollow rake," and the action of the chip in this case is to curl up much more than the curve on the tool, thus having a tendency to cut more freely and reduce back pressure. This would not be the case in turning cast iron as this metal breaks up immediately after being cut and does not curl as steel does. This conclusion of back pressure has never been theoretically proved by the writer, but is written from practical experience. It must be remembered that nearly all machining operations have certain peculiar characteristic points which require specially ground tools, yet the fundamental principle is the same for various metals to be machined.

It seems that a way for testing power consumed by these two styles of tools would be to use some "freak" tools such as shown in Fig. 2, as well as the examples already shown. *A* represents a tool ground with a flat top rake and relieved a short distance back of the cutting edge as shown at *B*. Example *C* also has a flat top rake for a distance shown at *D*, after which a hollow is ground to cause the chip to curl. These tools would naturally reduce back pressure to some extent. At *E* is shown a tool having a flat top rake *F*, relieved at *G*, and having a portion *H*, which the chip would strike

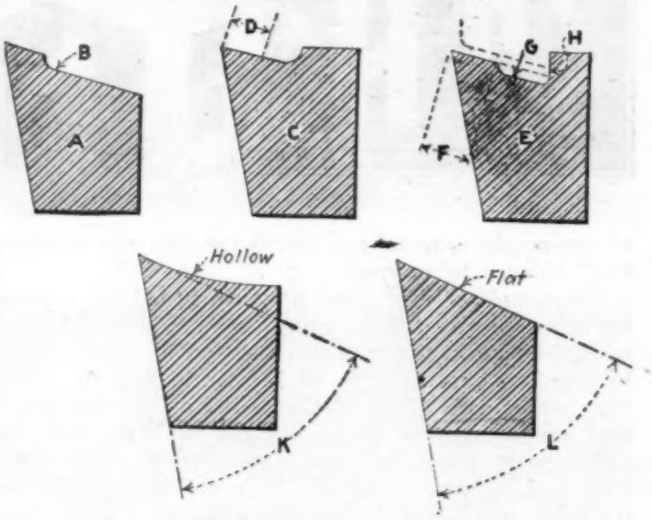


FIG. 2—TOOLS GROUND TO DETERMINE POWER CONSUMPTION

against and readily determine whether back pressure occurs, resulting in the use of more power.

While all of the tools referred to in the above examples are shown with flat top-rake, they can be made with hollow top-rake, but when so made it should be remembered that the cutting angle in all cases must be uniform, as shown at *K* and *L*, in order to make comparative tests.

Internal Thread Milling Tricks

By Joe V. Romig

Many designers and makers of thread-milling hobs, insist that hobs for internal work must not be made larger than one-third the inside diameter of the bore in order to cut free and to clear the helical angle of the thread. That this is not the case, as has been proved time and again by jobs that have come under the writer's observation during a long experience in such work.

One job in particular had a bore of 1½ in. in diameter to be milled with 10 threads per inch. Had the rule been followed out for this job the hob would have been

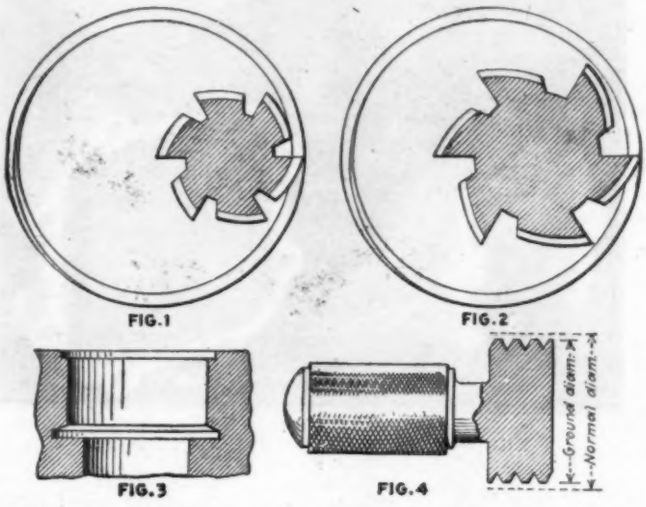


FIG. 1—ORDINARY AMOUNT OF RELIEF FOR SMALL HOBS. FIG. 2—MAXIMUM RELIEF FOR LARGE HOBS. FIG. 3—HOW THE HOLE SHOULD BE MACHINED. FIG. 4—GAGE WITH TOPS OF THREADS GROUND OFF

too weak to do any work at all and the fact that the hole was 1 in. deep, demanded that the hob be very strong.

Hobs equal to three-quarters the diameter of the bore were made and after gashing were relieved as per Fig. 2.

The main point to observe in the making of the larger diameter hob is the maximum amount of relief necessary for the clearance of the teeth.

A comparison of Figs. 1 and 2 will enable one to see the difference between an ordinary amount of relief and that of a hob having the maximum relief. All bores to have threads milled in them should have a recess at the bottom, in depth slightly in excess of the large diameter of the thread and this recess should be tapered to the angle of the thread as shown in Fig. 3. The outer end of the bore should be counterbored to the diameter of the thread and to the depth of one thread.

One of the common troubles experienced in milling internal threads is that when the tops of the hob teeth wear off, they make rounded bottoms in the threads, which will prevent the entrance of the plug thread-gage even though the thread may be over size in the rest of its form.

All gages for machine use should be ground off on the top of the thread as shown in Fig. 4. All thread-milled work should be sized with hand taps kept in good and sharpened condition. Then as a finished sizing gage, use a regular full thread gage of the regular type and no trouble will be experienced.

If one would insist in changing hobs, just as soon as the tip wears out of shape, there could be no production, therefore the above-mentioned rule.

What holds good on internal threads is just reversed on external threads, and the inside or root diameter of an external gage should be ground. The amount of grinding for best results is to remove the thread to ¾ its proper height.

A Tapping Device

By Bert Crouse

Having a number of large holes to tap in steel plates, I attempted to do the job in a drilling machine but found considerable difficulty in getting good results as the tap would chew up the threads and spoil the holes.

I then made the sleeve shown in the sketch and fitted it with a socket to hold the tap. The sleeve was keyed to the spindle of a drilling machine.

A thread of the same lead as the tap to be used was cut on the shank of the socket which was fitted to a plain hole in the bottom of the sleeve so as to slide freely on a feather. A nut provided with a lever was screwed on the threaded shank of the socket. The construction is shown in Fig. 2.

With the tap in the socket, and the lever on the nut placed against a stop on the machine table as shown in Fig. 1 the device was ready for use.

It will readily be seen that the threaded shank of the socket acted as a lead screw and was forced through the stationary nut as the spindle revolved. As the socket carried the top the latter was fed into the hole

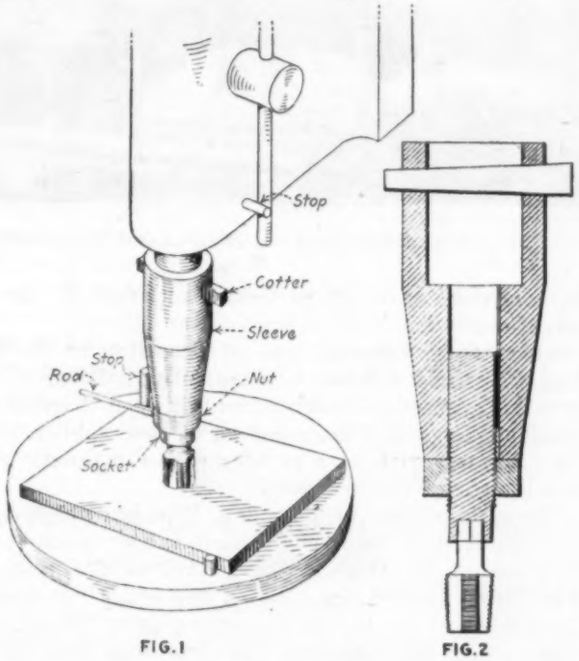


FIG. 1—TAPPING DEVICE READY FOR USE. FIG. 2—SECTION SHOWING CONSTRUCTION

the same amount per revolution as the lead of its thread.

The spindle of the machine was prevented from rising by a stop pin on the bracket which kept the feed lever from turning.

Some Vertical Grinding Jobs

By Herbert Crawford

The shop of the Worthington Pump & Machinery Corp., Harrison, N. J., has a number of interesting grinding jobs on vertical spindle machines, a few being illustrated herewith. Most of the machines shown are belt-driven Blanchards which have been doing duty for several years in a very satisfactory manner. The machine shown in Fig. 1 has a substantial two-jawed chuck fitted to the rotating table, and is holding a casting which forms part of a bearing box for one of their machines. This piece is shown as No. 3 in Fig. 2. Its joint surface is approximately 9 x 12 in. The general dimensions of the other pieces shown in Fig. 2 are about as follows: No. 1, 8 x 20 in.; No. 2, 13 x 14 in., and No. 4, 12 x 14 inches.

The wheel used is a Dayton combination 14-C grade I. The work is kept flooded with lubricants (Lubewell and Greasall mixtures) during the grinding operations. The grinding machine has superceded the miller on this work, the castings being ground from the rough

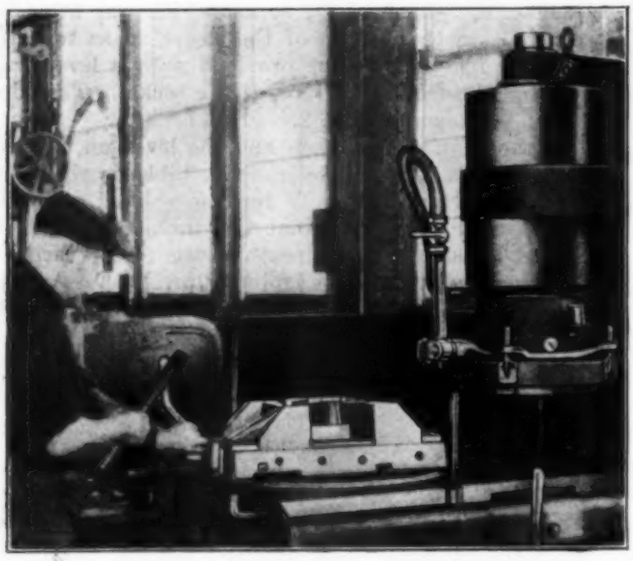


FIG. 1—GRINDING THE JOINT OF A JOURNAL BOX

to a finish that is perfectly satisfactory at one operation.

An entirely different type of operation is shown in Fig. 3. Hard rubber is frequently finished by the grinding process, notably fountain pen barrels and similar pieces. But the grinding of hard rubber, a non-magnetic material, on a grinder with a magnetic chuck is a bit out of the ordinary.

There is shown in Fig. 3 a Blanchard belt-driven machine with a load of 54 hard rubber pump valves in place on the table. These hard rubber disks are distributed around the base of the magnetic chuck in three rows of 12, 18 and 24 respectively. Those in the outer circle bear against the retaining ring on the outside of the magnetic chuck, while a central disk fits closely against the inner circle of disks.

Placed at frequent intervals between the various disks in all three rows are pieces of steel, mostly rectangular, but a few of them are round. These fill the spaces between the disks fairly well and act as stops, which effectually prevents any shifting of the disks

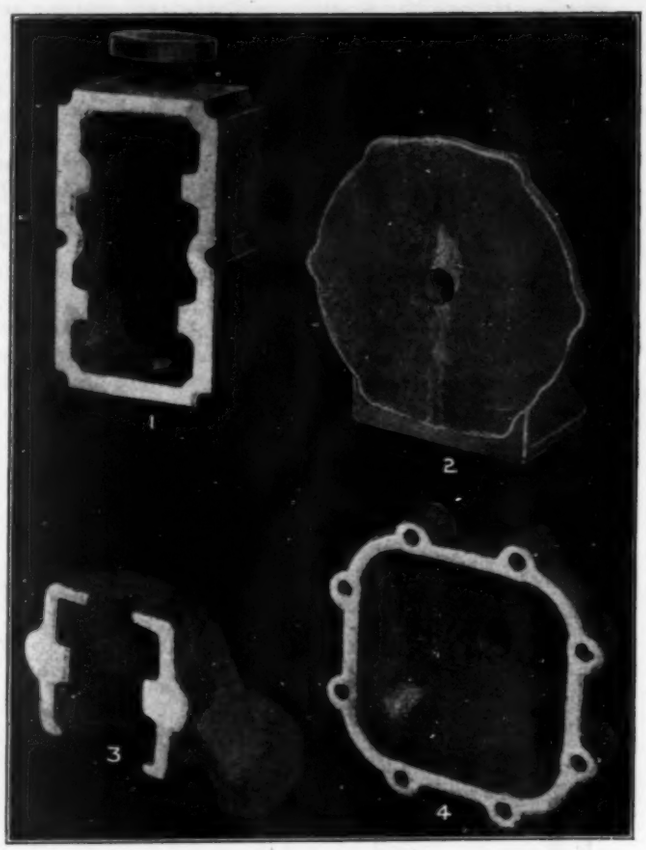


FIG. 2—A FEW OF THE PIECES GROUND IN THE SAME WAY

while they are being ground. These disks are 15/64 in. thick in the rough and 0.025 in. is removed from each side.

Both the roughing and finishing cuts are taken on this machine, the work being flooded with lubricant, as when grinding metal. The wheels used are Dayton special combination 24-36, grade M, and the cost of machining these parts has been materially reduced by this method, 500 pieces being ground to within ±0.0005 in. in 7½ hours or nearly ten loadings of the table.

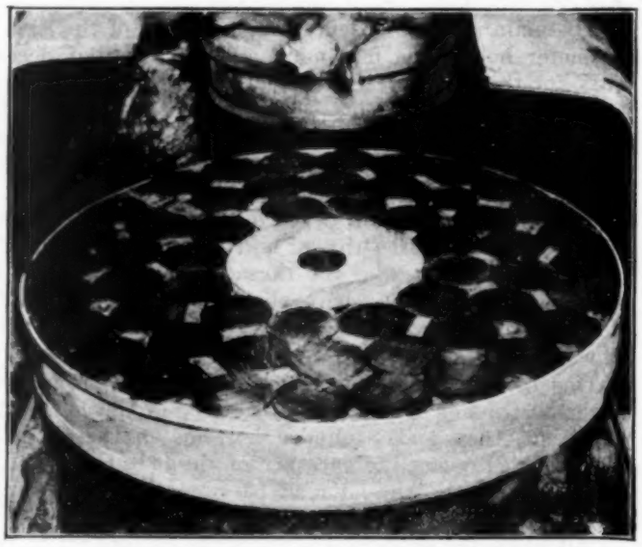


FIG. 3—GRINDING HARD RUBBER DISKS ON A MAGNETIC CHUCK

Cleanliness in Machine Tools and Accurate Inspection

By Arthur W. Andrews

One of the most important factors in the art of accurate machine tool inspection is that all instruments of precision be kept scrupulously clean at all times. A well equipped inspection department is an expensive branch of any manufacturing enterprise, and considering the value of these important tools, why should there not be a suitable place to keep and use them in? To be sure inspectors are not always working to ten-thousandths of an inch but when they do, it makes for efficiency to to be sure of their measurements without delay and annoyance from particles of grit, which are continually falling and settling on our tools unless we have an enclosure suitable for our outfits.

One of our most valuable tools is a set of Johansson or similar blocks. Their lapped surfaces must be taken care of, and unless we protect these surfaces as much as possible they become scratched. This is an annoyance rather than an inaccuracy, but if we are careless and do not eliminate this grit the blocks may become unreliable for checking up extremely accurate dimensions. We have been getting along very well with our measuring tools in general, but since the use of measuring blocks is becoming more common, we cannot exercise too much care when setting up our various combinations.

A great many inspectors use chamois to clean the blocks; others use fiber, claiming that fiber absorbs moisture more quickly than anything else. The palm-of-the-hand method however, seems to prevail in most cases. But how about the film deposited on the blocks?

A piece of rather stiff cotton cloth usually comes with each set of measuring blocks. I have found this very good but the cloth catches the dust and does not seem to be just the thing.

If any of the readers of the *American Machinist* could suggest anything better I am sure it would be beneficial to all of us in the craft.

Holding a Hammer Head on its Handle—Discussion

By F. L. Sylvester

On page 811, Vol. 57 of the *American Machinist* there appeared an article under the above title by Andrew J. Schwartz. While the method which he shows would undoubtedly hold the hammer head on securely it seems to me it is open to one serious objection and that is it requires the hole in the hammer head for the handle to be made to taper all one way. Now all of the machinists' hammer heads that I have seen have the hole smallest in the middle, enlarging both ways, so in order to use Mr. Schwartz's method it would seem to be necessary to go back a step and get the manufacturers to make special heads.

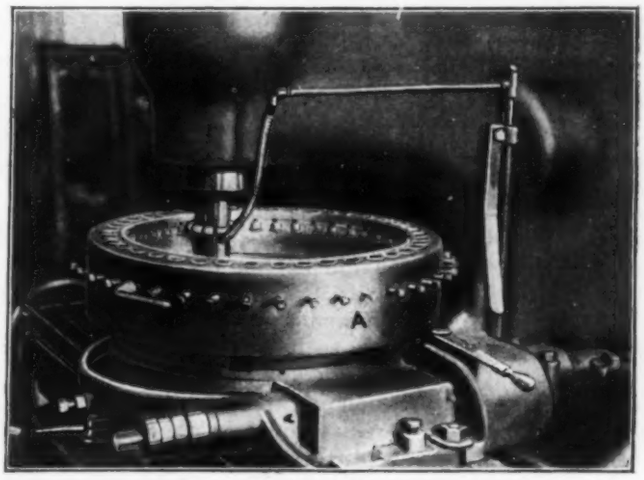
Of course this would be all right on new work, but it would not help out in replacing broken handles on the hammers already in use. In our place this work comes to me along with other varied duties. At first I drove in steel wedges the same as the makers do, and as others before me had done. But steel wedges frequently show a strong love of freedom; they very often work loose and come out, so now I have given up using them, and instead use hardwood wedges, dipped in glue and driven in. I make the wedges out of handle stock, which I cut up into pieces about 1¼ in. long, and then split into about ⅛ in. thick. These pieces would be rather hard to whittle to the proper taper for wedges, So I grind them to shape on a sandpaper faceplate in the lathe, holding them by one end with a pair of cutting pliers.

While the steel wedges used to come out quite frequently, I have not yet had one of these wooden wedges to come out.

Continuous Milling Fixture

By H. M. Clary

The illustration shows how a Milwaukee vertical milling machine in the plant of the Milwaukee Screw Production Co. was adapted for continuous milling by



CONTINUOUS ROTARY MILLING FIXTURE

the use of a special fixture on the table. The fixture consists of a heavy cast-iron ring *A*, which holds 42 piston pins in a vertical position. This is mounted on a rotary table driven by the universal joint at the right in the usual manner. Each piston pin is clamped in position as it is loaded, the change being made without stopping the fixture.

It will be noted that the fixture is cut away on the inside to allow the milling cutter to reach the pin and cut the groove for the connecting rod clamping bolt. A radius cutter ⅜ x 3¼ in. is used. The spindle speed of the machine is 168 r.p.m., and the table feed is 9 in. per minute which gives a production of 540 pins per hour.

The Value of Calculations in the Machine Shop—Discussion

By Elam Whitney

On page 616, Vol. 57 of the *American Machinist*, W. H. Kellogg contributes a very interesting discussion under the above title. Every machine shop or tool room employing several workmen should have a draftsman, not necessarily a high grade designer but a young man who can calculate problems in trigonometry and make layouts to an enlarged scale. The latter is of more importance than one would think and is a means of economy, as many problems can be quickly solved by making a ten times size layout and scaling the required dimensions.

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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
January 25, 1923

Self-expression or Sentimentalism

A LOT OF bunk is circulating about the worker's lack of opportunity for self-expression. To give a man instructions or even advice about how his tool should be ground, or what feed or speed he should use on a given job is considered equivalent to suppressing his individuality and reducing him to a mere machine. The cry is that every man should have a chance for self-expression.

The peculiar thing about it is that every man has that chance practically all the time but that, very wisely, he prefers to leave it alone when it happens to be against his interest. There is nothing to prevent him from expressing his individuality by wearing hip boots at a dance, or keeping his hat on in the presence of ladies or eating peas with a knife but does he do it? Not he, because doing it would hurt him. He would be laughed at and lose his social standing. It is more than doubtful whether there is much demand for opportunity for self-expression on the part of the worker himself. Probably it exists only in the mind of his would-be friends and uplifters. It is doubtful whether he appreciates being uplifted. He probably fears that he may lose his footing; he prefers to stand on solid ground. Besides he has unlimited chances for self-expression outside of the shop and he uses them.

He expresses himself by the way he treats his wife, raises and educates his family, by the appearance of his home and the flowers in his yard—or their absence—by the vote he casts, the books and papers he reads, the societies and clubs he frequents, the games he plays. He does not show the world that he is an individual with a soul and mind of his own by eating oatmeal with a safety pin or other fool stunts. And yet his so-called friends insist that he should be encouraged to do things in the shop in a way which has been discredited long ago and that he should be encouraged to express himself in ways which do no good to him or to others but which would hurt his employer and reduce the results of his labor.

The Engineer In Civic Life

RECENT DEVELOPMENTS indicate the occurrence of two interesting events, the realization by the public of the service it can command from the engineer and the awakening of the engineer to the fact that he can be a valuable public servant.

The latest addition to the list of eminent engineers in public life is Prince Gelasio Caetani, ambassador from Italy. Probably it is more than a coincidence that the new ambassador is of the same branch of the profession as Herbert Hoover and John Hays Hammond. The mining engineer must of necessity spend much of his time abroad and, if he has the right stuff in him, cannot but be broadened by the many contacts he makes.

Another instance of the recognition foreign countries are according to the engineer is the decision of Czecho-Slovakia to introduce the management methods of an American engineer, Frank B. Gilbreth.

The other side of the picture is presented by the renewed energy displayed at the recent meeting of American Engineering Council of the Federated American Engineering Societies in Washington. Founded primarily to make available to the country the advice and opinion of its engineers, the F. A. E. S. has struggled through its organization period and now seems to have its second wind. Its investigations of waste in industry and the twelve-hour work day are to be followed up by two other surveys of equal importance the subjects of which have not been announced. This will be good news for its supporters as even its best friends have had apprehensive moments during the period of growing pains.

"Engineering thinking" and "the engineering approach" may perhaps have fallen to the status of mere catchwords, but there is nevertheless a real need for the methods of the engineer in public office and the more of him this country can induce to enter its service the better.

Even the Worm Will Turn At Last

THE ACTION of angry citizens in the Southwest in wreaking summary vengeance on a recalcitrant rail striker who defied the authority of the local vigilance committee, is not to be condoned on any grounds of legality. Nevertheless, it should be a warning to the few men of this type in the ranks of organized labor that there is a limit to public patience beyond which it is not wise to step.

Faced with the loss of a needed public utility even the most pacific and easy-going of communities is likely to fight. When roused its citizens are quite likely to go farther than their calmer judgment would dictate as wise.

Generally speaking the average citizen is not easy to fool all the time. He usually has a pretty fair idea as to which side is in the right in an industrial dispute and his opinion does much to determine the winner.

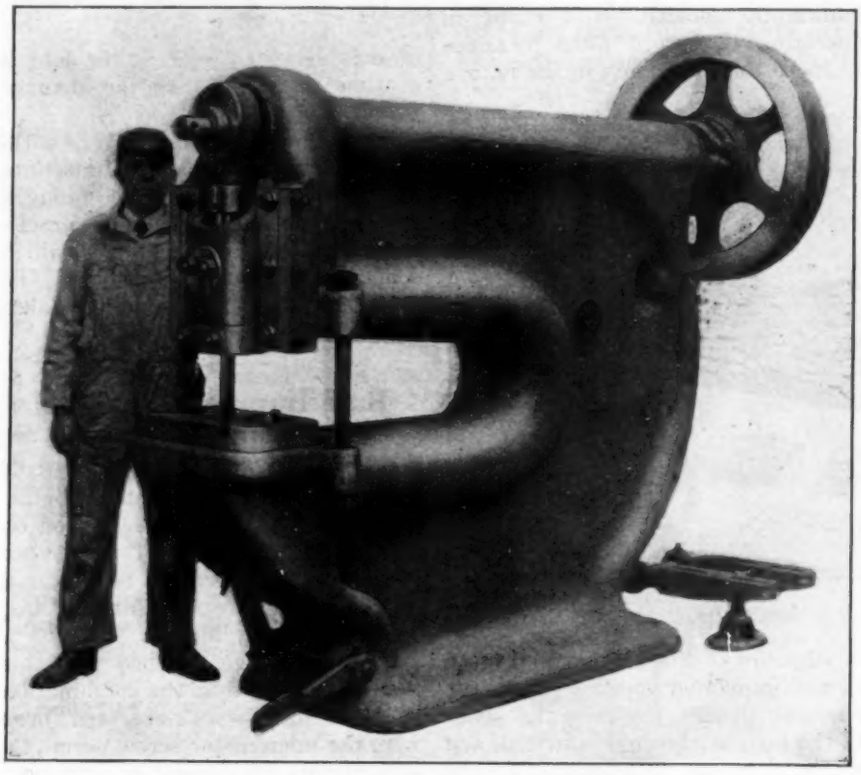
Malcontents in both camps of the coal controversy may well take heed of this small incident in an out-of-the-way town. If a harrassed public should come to the conclusion that both sides are wrong and that it is paying the bill, it may act hastily to the detriment not only of the parties at issue but of itself as well.

It would be a great pity if any such issue were forced in this country. As a nation we are well on the way to prosperous times with no fear of aggression from other nations and but little chance even of friction with them. Our only danger is from internal strife. Let us hope that those who might be instrumental in stirring it up will be warned in time.

Shop Equipment News

Ferracute Deep-Throated Punching Press

The punching press shown in the accompanying illustration is intended for punching and shearing bar metal, and is therefore more massive than machines used for cutting and forming sheet metal only. The machine is designated as the P43 deep-throated punching press, and has recently been brought out by the Ferracute Machine Co., Bridgeton, N. J. The frame of the press is of I-section and heavily reinforced to prevent springing under the stress of punching. Due to the depth of the throat the construction must be unusually rigid; the distance from the center of the ram back to the frame is 42 in. The press is intended to withstand a pressure of 35 tons. It is capable of shearing flat iron or soft steel ¾ by 5 in. in size, of punching a 1-in. hole in metal ⅞ in. thick, or of cutting off 1¼-in. round bars.



FERRACUTE DEEP-THROAT PUNCHING PRESS

The flywheel is at the rear of the frame, and is 35 in. in diameter and weighs 750 lb. The shaft on which it runs has bronze bearings, is 3½ in. in diameter and is forged with a large solid collar in which the clutch mechanism is mounted and which serves as the brake wheel. The front end is provided with an eccentric, fitted with a tapered bearing and held in place by a large nut. The construction is such that the shaft can be quickly assembled and removed without the withdrawing of any keys, the eccentric being driven by a feather in the tapered part of the shaft. This construction not only enables a variety of strokes to be attained by substituting other eccentrics, but it leaves the shaft almost full size where it projects from its front journal bearing.

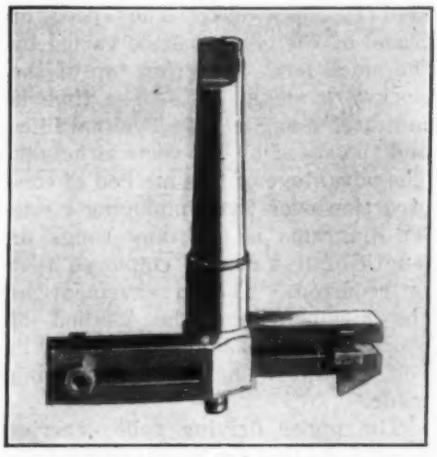
The ram is guided by two gibs, allowing accurate adjustments for wear. The pitman contains a pivot so mounted in the ram that a large bearing surface of solid metal is obtained. The pitman stem is firmly gripped by a telescopic nut forming the pivot and made in halves clamped together with heavy bolts. The press has a stroke of 1½ in. and a ram adjustment of 3 inches.

The stay rods shown fitted to the press can be employed when very heavy punching is being done and it is not necessary to have the throat entirely clear, as the rods prevent springing. The motor shelf shown attached to the back of the frame can be furnished to meet the requirements. The press is 35 in. wide, 48 in. deep, and has a height of 83 in. Its total weight is 5,350 pounds.

Jiffy Adjustable Fly-Cutter

An adjustable fly-cutter, known as the Jiffy drilling machine cutter, has been placed on the market by Paul W. Koch & Co., 19 South Wells St., Chicago, Ill. The body of the tool is made of malleable cast iron, machined and polished all over. The tool carries two tool-steel cutters, as shown in the accompanying illustration, either of which can be easily adjusted by loosening a nut. The device is intended for use in cutting holes in fiber sheets, metal plates, or work up to ⅞ in. thick.

The tool is made in two sizes, the smaller one cutting diameters from 1¼ to 3 in., and the larger one diameters from 1½ to 6 in. The taper on the shank of the smaller tool is No. 2 Morse and the larger No. 3 Morse. Special cutters can be obtained to cut metal 1¼ in. thick.



JIFFY ADJUSTABLE FLY-CUTTER

O-Z Hand Tachograph

A tachometer having an attachment by means of which charts can be made to graphically record the speed of the mechanism being observed, has recently been placed on the market by O. Zernickow, 15 Park Row, New York, N. Y. The instrument, which is known as the O-Z hand tachograph, is shown lying in its case in Fig. 1. The tachometer itself is similar in general construction to the tool described as a Cutmeter on Page 926, Vol. 54 of *American Machinist*.

Various types of points, shown lying in front of the instrument, are furnished, as well as a wheel by means of which peripheral speeds can be measured. The mechanism is sufficiently damped to prevent vibration of the indicating needle. The dial is 3 in. in diameter and the net weight of the instrument is 2 pounds.

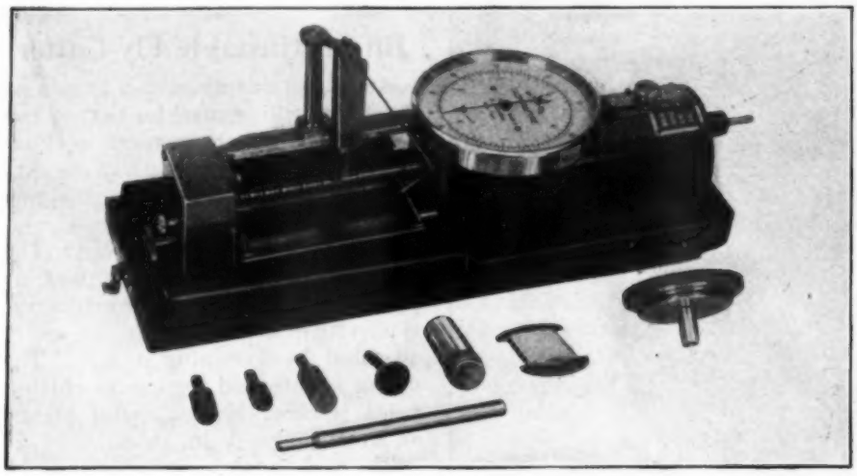


FIG. 1—O-Z HAND TACHOGRAPH

As regards the recording mechanism that makes the chart, a plain strip of paper is fed through the device by means of two rollers operated by clockwork. The speed of travel of the paper can be varied by the small lever shown on top of the clockwork at the left. The time is indicated along the longitudinal lines and the speed by the vertical height. The advantage of this method of construction over that employing circular diagrams is that any range or length of test can be employed that is required. The arrangement of the members and the method of operation can easily be observed in Fig. 2, which shows a chart being made.

The upper driving roller carries small disks that are in contact with the large inking roller, so that the disks draw parallel longitudinal lines on the strip of paper. The disks are so placed on the roll that the position of the pen in relation to the longitudinal lines agrees with the reading on the dial of the instrument. The pen that draws the line indicating the speed is the one at the right. It is actuated through a suitable mechanism of levers by means of a pin that extends from the end of the tachometer itself.

Practically all fluctuations of speed, whether as slight as 1 or 2 per cent of the total speed, or of great variation such as when shutting down rotating equipment, can be recorded. It is stated that the mechanism is sufficiently sensitive and rapid in operation to record quick changes of speed that are much in the nature of vibrations. Since the actual speed is not imprinted on the chart, the operator usually observes the speed in the test, as shown by the dial, and marks it on the parallel lines of the chart to serve as a matter of record.

The entire range of the width of the paper strip is available to indicate the speed throughout each range of the tachometer. These ranges are controlled by the thumb-slide on the instrument itself. When the pen arrives at the edge of the paper, the next range can be engaged by the gear shifting mechanism connected with the thumb-slide, so that clear registration of small fluctuations in speed can be observed. The instrument is normally furnished with a range from 60 to 8,000 r.p.m., although it can also be supplied for speeds from 30 to 24,000 r.p.m.

At the left of the mechanism there is a second pen that normally traces a line parallel to the direction of the paper travel. Every second it draws a small vertical line, being caused to operate by a clockwork mechanism. Since the speed of travel of the paper can be varied, the small vertical lines or dots serve to indicate the length of time through which the changes in speed occurred.

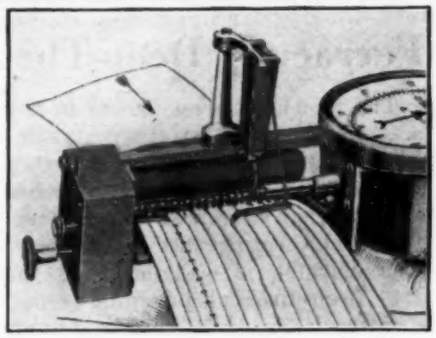


FIG. 2—RECORDING MECHANISM OF O-Z TACHOGRAPH

The inking roller can easily be withdrawn for cleaning and reconditioning. The tachograph can be brought to the work and used under practically the same conditions for which a plain tachometer is employed. The fact that it is direct-reading makes the instrument easy to employ.

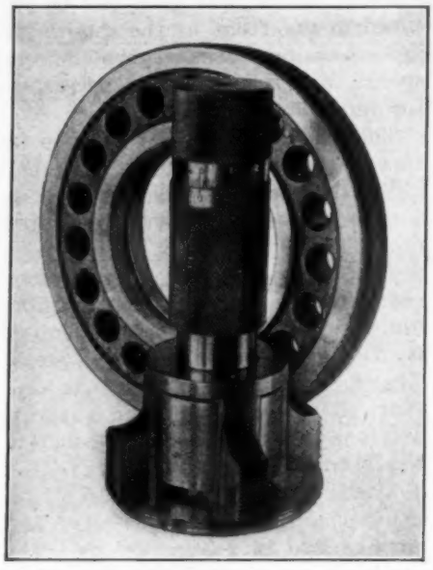
Bath Improved Internal Thread Micrometer

An improved form of the Bath internal thread micrometer, similar in principle to the one described on page 1102, Vol. 54 of *American Machinist*, has recently been placed on the market by John Bath & Co., Inc., Worcester, Mass.

The advantage claimed for this type of tool is that the combination of the sliding-wedge-operated jaws with the micrometer screw permits a very minute adjustment or increment of diameter to be represented by a considerable movement of the graduated dial, or thimble. The space between figures on the thimble corresponds to a variation of 0.001 in. at the measuring jaws, and as each of such divisions is sub-divided into ten equal spaces, readings in "ten-thousandths" are easily obtainable.

The bases of the jaws have an extra wide bearing upon the inclined bearing surfaces of the body, tending to impart rigidity to the tool. The outer flange that serves to protect the jaws also acts as a pilot to assist the operator in entering the tool correctly in the thread to be measured. The thread of this pilot is made 0.020 in. smaller in pitch

diameter than the nominal size of the micrometer. Four grooves cut across the periphery of the pilot assist in cleaning out any dirt or chips



BATH INTERNAL THREAD MICROMETER AND MASTER RING

that may have lodged in the threads to be measured.

What amounts practically to a line contact in measuring threads within the capacity of the tool is secured by grinding the threads in a final grinding operation while the tool is set at the minimum diameter of 0.020 in. below nominal size. The effect of this grinding is to make each jaw "high" at a line midway of its thickness, falling away slightly as either edge is approached, and to prevent any interference of helix angles due to slight disparity between nominal and actual sizes of the threads to be measured.

Each size of micrometer is supplied with a master ring. The ring is recessed upon both sides, and holes through the web serve the double purpose of lightening the tool and making it less liable to distortion in hardening or subsequent mishandling. A recess midway of the bore divides the threaded portion into two equal parts without interrupting the continuity of the threads. The object of this construction is to avoid "bell-mouthing" of the gage, either in the making or in service, and to lessen the friction of the threaded surfaces when setting the micrometer to size.

These micrometers can be supplied in all commercial sizes from ¾ to 8 inches. The capacity of each ranges from 0.020 in. below to 0.020 in. above the size marked on the body.

Shore Model-D Dial Recording Scleroscope

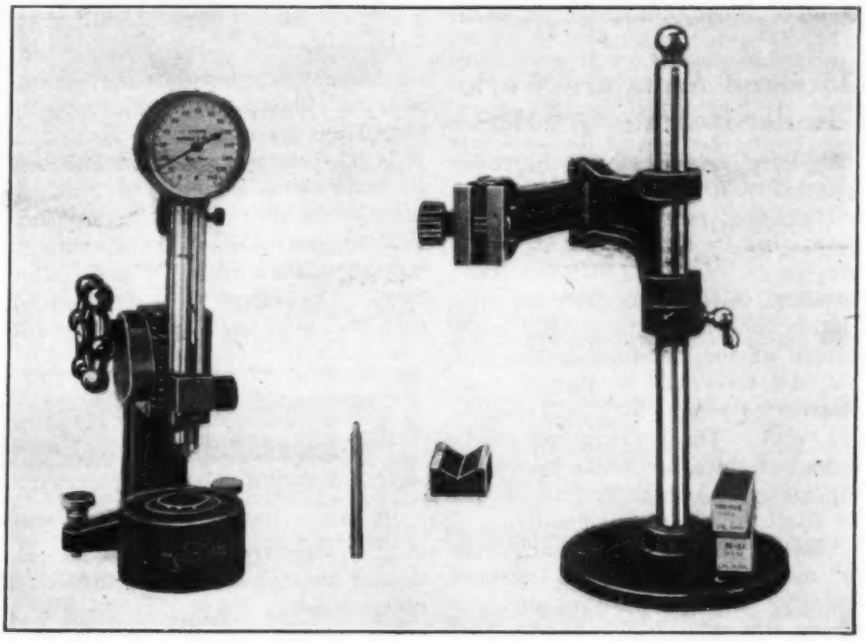
The last model of the scleroscope made by the Shore Instrument & Manufacturing Co., Van Wyck Ave. & Carll St., Jamaica, N. Y., in which instrument the height of rebound of a small hammer striking the work is read on a vertical scale to indicate the hardness of the test piece, was designated as Model C1 and was described on page 742, Vol. 56, of *American Machinist*. A machine which is similar in principle in so far as it employs a hammer that is dropped on the work, but which indicates the hardness on a circular dial and gives a permanent indication of the value, has now been developed by the same manufacturer. The new instrument, which is designated as the Model D recording scleroscope, is shown in the accompanying illustration.

The hammer is considerably longer and heavier than that employed in the previous model. It can be seen in the foreground in the accompanying illustration. It is permitted to drop but a short distance, ¾ in. being the height of the drop. The amount of energy with which the hammer strikes the metal is always constant, and it is employed to overcome the penetrative resistance of the metal under test. That energy which is not absorbed in deforming the test piece is available for reacting upon the hammer. The height of rebound is thus proportional to the hardness of the piece.

A mechanism is incorporated for catching the hammer at the top of its rebound. It consists in the main of a sensitive, one-way ball clutch and pilot sleeve. This mechanism normally holds the hammer at its upper starting position. When released, the pilot sleeve and clutch fall with the hammer, although slightly after it; and even though the rebound of the hammer be very slight, the one-way clutch causes the hammer to be held in position at the top of its rebound.

Following this cycle, the clutch assembly is raised to its starting position, carrying the hammer with it in its now superposed position. When the hammer comes to its upper or starting position, it actuates a rack and pinion and hair-spring pointer mechanism to indicate on the dial the amount of rebound and, therefore, the hardness of the specimen. The hardness values indicated on the instrument agree with those read on the vertical scale of the Model C scleroscope.

In operating the instrument, the knurled screw shown at the bottom of the vertical tube is turned in a clockwise direction about five-eighths of a turn, until an internal stop is reached. This movement is sufficient to elevate, release and then drop the hammer. After the hammer has struck the work, rebounded and been caught at the top of this rebound by the clutch in the retainer



SHORE MODEL-D DIAL RECORDING SCLEROSCOPE

sleeve, the small knurled knob is caused to turn in the reverse direction by means of a spiral spring, and to raise the hammer and the complete unit holding the clutch. The amount of rebound on the hammer is then indicated on the dial, the needle of which stays in position until the small knob is again turned in a clockwise direction to drop the hammer and make the next test. It should be noted that pneumatic actuation is not employed, as in the Model C machine.

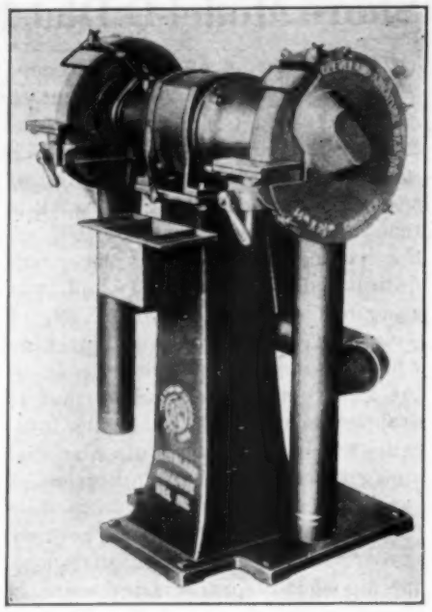
In the illustration, the instrument is shown dovetailed into the pinion block of its clamping stand in the position in which it is used for testing the hardness of sheets, flats and balls. The stand shown on the right has a swinging arm, and is employed for testing samples that are underweight or very slender and which need to be clamped in a vise, or else it is used for testing heavy pieces placed on a bench plate.

On work that is too heavy to move, it is possible to remove the instrument from its stand and hold it in the hand while making the test. The ease and speed of operation are the principal features of the scleroscope. It is ruggedly constructed and should be of use on a variety of work.

Cleveland Armature Works Roller-Bearing Grinder

A direct-driven electric grinder equipped with Timken tapered roller bearings has recently been placed on the market by the Cleveland Armature Works, Inc., 4732 St. Clair Ave., Cleveland, Ohio. Aside from the antifriction characteristics, the main feature of the bearings is the fact that adjustment can be made to compensate for wear which will eventually occur. The bearing can easily be made tight after it has been used long enough to wear and to permit the shaft to become unsteady.

Another feature of the machine is the motor with its high overload capacity. Motors for either alternating or direct current can be furnished. In the alternating-current motor, both the rotor and the stator are assembled and secured by means of electric welding. The control of the motor is by means of a positive, quick-acting switch carried in a steel cabinet on the back of the base. The handle for operating the switch is at the front of the machine, where it can be manipulated by the elbow of the operator, even though he should



C.A.W. ROLLER BEARING GRINDER

have both hands full. In the single-phase motor, the "cut-out" is also mounted in the cabinet at the back of the frame, and not on the rotor shaft.

A lock is provided to hold the shaft stationary when wheels are being changed. The wheel guards and the rests are adjustable and are clamped by means of handle nuts, so that no wrenches are necesary. Eyeshields made of heavy plate glass can be secured to the front of the guards to protect the eyes of the operator from sparks, and it is thus not necessary for him to wear goggles.

The machines can be furnished in three styles of mountings, on either a floor pedestal, a bench pedestal, or a post bracket. It should be noted that the front corners of the floor pedestal are cut away to give foot room for the operator, and to allow him to stand in the most convenient position for manipulating the work. The floor pedestal extends to the rear, so as to give a solid support, and it is partially filled with concrete to add to its rigidity.

The illustration shows a 3-hp. machine running at 1,800 r.p.m., and carying two 14 x 2 in. wheels. The machine can, however, be furnished in horsepowers of 1, 2, 3 or 5. A motor running at 3,600 r.p.m. can be furnished in either 1 or 2 hp. Special attachments and fittings can be provided to meet conditions.

Hanlon & Wilson Helical Expansion Reamer

An expansion reamer having helical blades, as shown in the accompanying illustration, was recently placed on the market by Hanlon & Wilson, Wilkinsburg, Pa. The tool is particularly adapted to reaming holes containing oil grooves or cavities which make reaming with a straight-blade reamer unsatisfactory. The range of expansion of each tool is $\frac{1}{16}$ in. The tool is made in diameter from $\frac{3}{4}$ to $1\frac{1}{4}$ in., although larger sizes can be furnished as special.

The segments having the helical cutting edges form a complete cylinder when assembled, with the exception of the portions removed when cutting them from the solid cylinder. The tapered keys fit in the cylindrical bore formed by the segments, the keys and the segments being so interlocked at their ends to insure the proper relation between the members at all times.

HANLON & WILSON HELICAL EXPANSION REAMER

The reamer consists chiefly of a central spindle or arbor threaded in that portion of its length on which the blades are fitted. The arbor contains slots, the bottoms of which form a cone about the axis of the arbor. Keys or wedges are fitted in the slots, the taper on the bottom of each key corresponding with the taper at the bottom of the slot, while the outer surfaces of the keys lie in the surface of a cylinder.

An intermediate washer is placed between the cutting segments and the adjusting nuts, to prevent injury to the adjusting nuts when making a change in the diameter and to hold the blades from expanding to a diameter greater than that for which the tool is set.

The diameter over the blades is varied by advancing the cutting sections lengthwise along the spindle by means of the adjusting nuts. Since the keys travel in the tapered slots, the diameter over the blades can be expanded or contracted.

News Section

November Exports Show Gain

The exports of metal-working machinery during November were valued at $926,993, which was an increase over those of October when the report showed valuation to the amount of $902,188, and a decided increase over those of November, 1921, when they were $672,810. The detailed figures, obtained from the Bureau of Foreign and Domestic Commerce are as follows:

EXPORTS METAL-WORKING MACHINERY

	October 1922	November 1922
Lathes	$57,161	$41,123
Boring and drilling machines	34,262	57,670
Planers,sharpeners and slotters	38,256	19,975
Bending and power presses	7,179	12,417
Gear cutters	983	11,707
Milling machines	69,389	33,118
Sawing machines	1,800	3,573
Thread cutting and screw machines	7,464	34,926
Punching and shearing machines	14,977	2,848
Power hammers	10,386	11,820
Rolling machines	786	93
Wire-drawing machines	935	20
Polishing and burnishing machines	1,248	623
Sharpening and grinding machines	76,044	72,460
Chucks, centering; lathe, drill and other	19,102	14,136
Reamers, cutters, drills and other parts for machine tools	121,944	80,303
Pneumatic portable tools	26,550	53,753
Foundry & molding machinery	41,314	49,368
Other metal-working machinery and parts of	370,408	427,060
Total metal-working machinery	$902,188	$926,993

National Can Corporation is Formed

Neil McMillan, formerly secretary and general manager of the National Can Co., has been made president of the newly organized National Can Corp., which has taken over the National Can Co. The new organization is incorporated for $1,150,000 and is located in Detroit, Mich. It is the plan of the corporation to increase the number of radiators manufactured by it within the coming year.

Business Paper Editors Meet In Washington

The usual monthly gathering of the members of the National Conference of Business Paper Editors took place on Monday, January 15. The morning was devoted to a session in the conference room of the Chamber of Commerce of the United States at which plans for the annual meeting of the Chamber and other activities of that body were presented and discussed.

At noon the editors were entertained at luncheon by the technical staff of the Bureau of Standards in the Bureau Lunch Club. The afternoon was spent visiting various divisions of the Bureau and listening to a talk on the work of the Division of Simplified Practice.

In accordance with the regular custom, Mr. Hoover was the guest of the Conference at dinner and talked over with members department and national problems.

Death Claims A. B. Landis

A. B. Landis, aged 68 years, died suddenly of heart disease December 20 at his home, Chestnut Hill, Pa. Mr. Landis was long identified with the machine tool business, having been actively engaged with several different concerns since 1874. For several years he was associated with his brother F. F. Landis at Waynesboro, Pa., and later, having sold their plant to the Geiser Manufacturing Co., he became the superintendent of the tool department. While with

A. B. LANDIS

this company, he developed and perfected the Landis grinding machine. In 1890 he again formed a partnership with his brother, and manufactured cylindrical grinding machines. Seven years later the plant was destroyed by fire and a stock company was formed to take over the assets of Landis Bros. Mr. Landis became the superintendent and mechanical engineer of the newly formed company which was known as the Landis Tool Co. Later the Landis Machine Co. was started for the purpose of making and marketing the Landis threading machine. In 1910, Mr. Landis severed his connection with both the Landis Tool Co. and the Landis Machine Co. and moved to Chestnut Hill, Pa., where he opened an engineering laboratory for the perfecting of many inventions. In the fall of 1919, he organized the firm of A. B. Landis and Sons for the purpose of commercial grinding and the development of many mechanical ideas. Mr. Landis was active up until the time of his death.

Railroads Ask for Liberal Policies

By a preliminary report filed by the railroads with the United States Coal Commission, the adoption by legislative and regulatory bodies of a liberal policy toward the carriers in order that railroad credit can be strengthened was urged.

O. D. Street Elected Vice-president of McGraw-Hill Co.

O. D. Street, well known for the past ten years as general manager of distribution of the Western Electric Co., has been elected vice-president of the McGraw-Hill Co., in executive charge of the *Electric World, Electrical Merchandising, Journal of Electricity and Western Industry, Industrial Engineer, Electric Railway Journal* and *Bus Transportation.*

Mr. Street has been with the Western Electric Co. since his graduation at Williams College. During the War he rendered valuable service in reorganizing the warehousing division of the Quartermaster Corps.

Kingsland Shop Foreman Talks on Practical Welding

E. S. Eldridge, welding foreman, Kingsland Shops, Delaware, Lackawanna & Western R.R., spoke on practical welding before the Metropolitan Section of the American Welding Society, at the Engineering Societies Bldg., New York City, Jan. 16. The talk was informal. It dealt with specific railroad welding jobs, and was accompanied by blackboard sketches. The enthusiasm of the talker and the members of the society was unusual, indicating that, although railroad shops may be negligent in many respects, the practical welding men are on their toes and out to learn all that they can.

Starkey Talks on Steel Testing Method

An interesting meeting of the American Society for Steel Treating was held in the Assembly Room of the Merchants Association, New York, on the ninth floor of the Woolworth Building, Wednesday January 17. Frank H Starkey, Hartford, Conn., delivered an interesting talk on "Spark Test Method for Testing Steel." Black board illustrations were used.

Engineers Museum Committee is Appointed

The Joint Committee on a National Museum of Engineering and Industry appointed by the four Founder Engineering Societies of United Engineering Society, 29 W. 39th Street, New York, is composed of Edward D. Adams and Charles L. Clarke of the American Institute of Electrical Engineers, Frederic A. Delano and Dr. George F. Kunz of the American Institute of Mining and Metallurgical Engineers, Clemens Herschel and Nelson P. Lewis of the American Society of Civil Engineers and Reginald Pelham Bolton and Holbrook Fitz John Porter of the American Society of Mechanical Engineers, the latter acting as Chairman.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE OUTLOOK is confusing to a degree that is almost without precedent. France has carried her peaceful penetration of Germany so far that what is almost a state of war exists, and a political bridge has been built into Germany over which the Red Army of Soviet Russia may at any time advance toward the Rhine. This Red Army is said to include 1,200,000 well fed and well equipped men who are for the most part officered by Prussians. French francs have fallen to 6.63. Belgian francs are still lower at 6.02, and German marks are almost worthless, being quoted at 4/5 cents a thousand.

But in the face of conditions so omnious the markets in both England and the United States are unperturbed, money is in abundant if not redundant supply, and an issue of $100,000,000 bonds brought out on behalf of the Anaconda Copper Company, with many other smaller offerings, have been readily disposed of.

In the commodity markets the course of prices and the outlook are equally inconsistent. It is generally admitted that the export demand for cotton will be much curtailed by the developments in Europe, but the cotton market has nevertheless advanced to the highest prices thus far touched this season and a further rise is confidently looked for.

Not a few other basic commodities have also moved upward and at 33⅓ cents rubber in particular is worth about twice what it sold for a year ago. The fact seems to be that the speculative spirit always engendered by war is being aroused and is ready to take a hold of any opportunity that promises a profit. This generalization appears to be justified by the advance in Stock Exchange memberships, which sold at $100,000 last week.

But back of it all is the continued increase in the gold held by our Federal Reserve Banks which gained another $15,000,000 last week and now stands at the record figure of $3,077,492,000. Concurrently there was a decline of $56,000,000 in the circulation of Federal Reserve Notes and the result is that the reserve ratio rose 2½ per cent during the week and now stands at 76.1 per cent.

This assures a continuance of the easy money upon which speculation thrives and as long as America refuses to take alarm at the barking of the European war dogs it is probable that the buoyancy of the markets will persist.

But this is not a probability upon which sagacious men will hazard too much for it is quite possible that in the ever changing kaleidoscope of European affairs we may shortly see a new political or miliary alignment that will be disturbing even to those who believe that America's detachment insures our prosperity no matter what happens elsewhere.

Those who are wise will therefore continue to be cautious. They may miss some opportunities to make quick profits, but they will also avoid the hazards of a period in which decreasing production and advancing prices are together at work to check the increase of wealth and undermine prosperity.

This is a truism that is always vindicated by the event, though it is not always understood because advancing prices have a tonic effect upon sentiment until it begins to be apparent that they have checked the distribution of goods by compelling the ultimate consumer to reduce his purchases.

"Those who are wise will therefore, continue to be cautious. They may miss some opportunities to make quick profits, but they will also avoid the hazards of a period in which decreasing production and advancing prices have a tonic effect upon sentiment until it begins to be apparent that they have checked the distribution of goods by compelling the ultimate consumer to reduce his purchases."

Some such development appears to be casting its shadow before, for a report from Milwaukee dealing with conditions in the underwear trade says that "a general price increase of about 15 per cent over last year is reported by salesmen leaving for their territory on a spring selling trip. The advance has tuned down buying somewhat but because underwear is a necessity it is not expected there will be a 'buyers' strike'."

But in other lines there are no signs of decreased activity as yet. Textiles generally are in good demand. Lumber is firm and higher, reflecting the expectation of continued activity in the building trade next spring. The steel mills are well employed and sold ahead. Copper is a shade easier at 14⅝ cents. Coffee is distinctly higher upon the belief that the Brazilian Government has reduced its holdings to a point at which they no longer menace the market. Sugar is a shade easier upon the belief that European buying will be checked.

The government has at last been able to make public the figures of our imports for September and October. They were valued at 617 millions as against 357 millions in 1921. The increase was of course the result of an effort to bring in goods before the new tariff bill became a law. The figures for November and December are not yet published. They may tell a different story. The December exports show a falling off of thirty-six millions as compared with November, and a total for the year 1922 that is 653 millions under the value of our exports for 1921.

The Cuban loan of $50,000,000 has been finally arranged with J. P. Morgan & Company. The proceeds will doubtless help to lubricate the financial machinery of the island which has been somewhat creaky for two years or more.

The British Commissioners over here to settle England's debt to our government are returning. It is believed that they offered to fund the obligation in 66 year bonds bearing interest at 3 or 3½ per cent, but that the President told them that Congress was not yet in a mood to accept their proposition. Perhaps Mr. Harding is counting upon a change in the Congressional attitude toward those who are indebted to us when it comes to be understood that day by day in every way Europe will continue to get poorer and poorer until her governments and her people realize that it costs more than it comes to, to collect international debts by force of arms.

For nearly four years the world has been kept in a state of irriation and economic paralysis while parliaments and prime ministers have been trying to adjust these international obligations The cost in misspent energy and lessened production probably exceeds the principal of the debts in question.

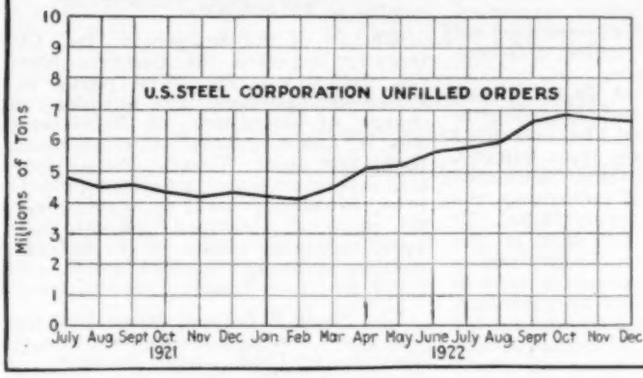
If including the reparations they were all cancelled and forgiven the era of good feeling and prosperity that would follow would probably bring an increase in the world's wealth that would be far greater than the sum total of the obligations involved. The hope of humanity is that some statesman can be found who will have the courage and the vision that will induce an acceptance of this view. In default of such leadership Europe appears to be drifting toward another war and ultimate chaos.

Dodge Corporation Makes Changes

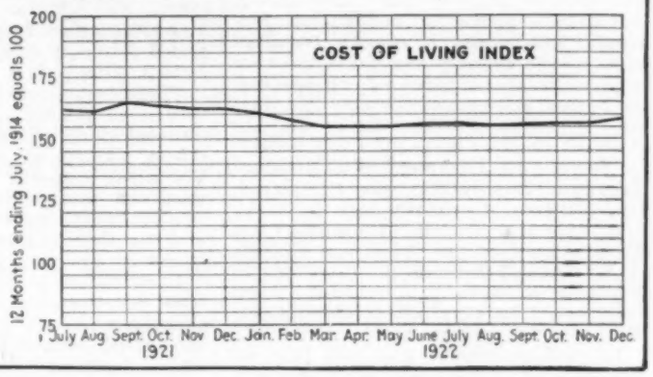
The Dodge Sales and Engineering Co., Mishawaka, Indiana, which has for the past eight years been operating as the selling subsidiary of the Dodge Manufacturing Co. and Dodge Steel Pulley Corp., has now been consolidated with the Dodge Manufacturing Corp., which was organized and began business last July.

The District Sales Organization of the Dodge Sales and Engineering Co. will be continued as branches of the Sales Department of the Dodge Manufacturing Corporation. The consolidation was accomplished for the purpose of simplifying sales and giving better service to the customers of the corporation.

Unfilled orders of U. S. Steel Corporation based on the monthly reports showing the forward tonnage on the books at the end of each month.



Index of the Cost of Living based on weighted retail prices collected monthly and compiled by the National Industrial Conference Board.



UNFILLED ORDERS on the books of the United States Steel Corporation on December 30 totaled 6,745,703 tons, which is a slight decrease as compared with November, when the number was 6,840,242 tons and also a decrease as compared with the figures of October 30 when the number of unfilled orders amounted to 6,902,287 tons. From February until November the rise was steady and it is expected that with building opening up in the Spring, or perhaps in February in some parts of the country, and with railroads buying more rails and equipment, the number of unfilled orders will again increase, although the totals may be kept down by exceptionally steady work on the part of the mills.

Cost of Living took a slight jump during the month, but the increase was so small as to be almost imperceptible. It is still less than that of a year ago and the records of previous years would presage that foodstuff may lower and drop from now on, but nothing of a radical nature should be expected. Employment in every part of the country is in a much better condition than for some time past, wages are good and future prospects for the United States are brighter than they have been for the past two years. What slight increases or declines that are registered in the cost of living are of little importance when employment is in a normal condition and wages are as fair as they are at the present time.

Comparative Prices of Shop Supplies

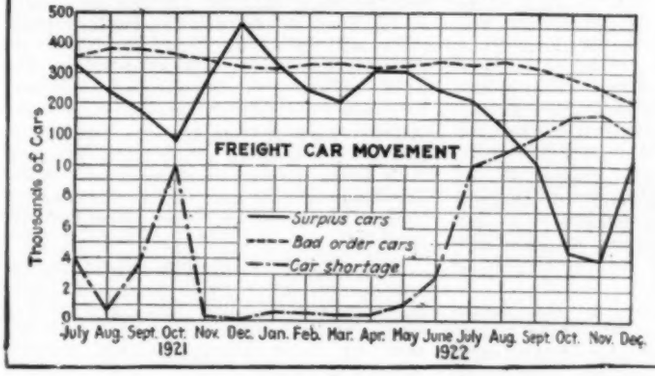
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0296	$0.0295	$0.0256
Cold finished shafting	per lb	0.0378	0.0378	0.0338
Brass rods	per lb	0.1742	0.171	0.155
Solder (½ and ½)	per lb	0.2425	0.24	0.2058
Cotton waste	per lb.	0.1175	0.11	0.104
Washers, cast iron (¼ in.)	per 100 lb.	4.33	4.33	4.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	3.11	3.20
Lard cutting oil	per gal.	0.5583	0.59	0.55
Machine oil	per gal.	0.36	0.36	0.40
Belting, leather, medium	off list	49%	37%	0.47
Machine bolts up to 1 x 30 in.	off list	51⅛%	55%	0.65

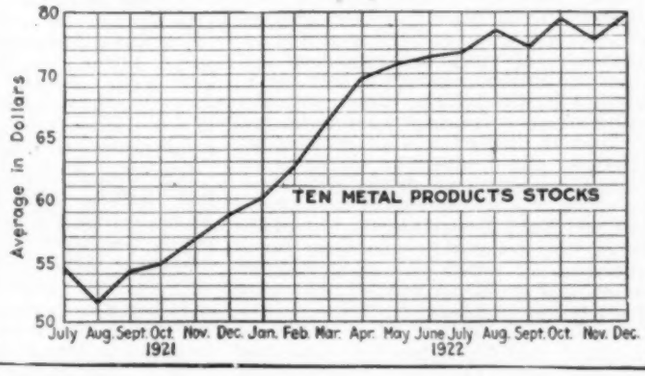
Freight Car Movement this month shows healthy declines in bad order cars and also in car shortage, while the surplus cars have taken a big gain after two months of decline and the figures today bring the standard up to approximately the same place as in September. Manufacturers may note with satisfaction that the freight cars in bad repair are each month becoming less and it is not unreasonable to expect that in the Spring there will be many more freight cars taken from this classification and placed into the surplus car column. It is also an indication that the railroads are spending more money toward improvement.

Ten Metal Products Stocks that were averaged during the month showed an inclination generally toward increases and the chart this week shows an advance which is worth noting. The comparison with the condition of this market last August when it reached the lowest point in the last eighteen months is particularly marked and the line will show that the increase has been remarkably steady in metals with only seasonal set backs. If last year is to be considered a criterion, the future will show firm gains each month but it is not expected that they will be nearly as much as is indicated by the chart herewith shown. Business is much steadier in most lines of metal products and in many cases factories are working at nearly 100 per cent capacity.

Monthly average of car shortage surplus and bad order cars in the United States based on returns to the car service division of the American Railway Association.



Monthly average: Ad. Rumely; Allis-Chalmers; American Can; Cont. Can; Gen. Elec.; Int. Harv.; Nat. Acme; Und. Type.; West. Elec. & Mfg. Co.; Worth. Pump.



Notes From Washington

By Paul Wooton

Hearty support for a National Hydraulic Laboratory is coming from all parts of the country and from the men engaged in all branches of engineering, the Senate sub-committee was told during the course of a hearing on Jan. 10 at which Senator Ransdell's bill providing for the establishment of a National Hydraulic Laboratory was considered. The principal testimony was given by John Lyle Harrington, of Kansas City, the president of the American Society of Mechanical Engineers; Gardiner S. Williams, of Detroit, a hydraulic engineer, and John C. Ralston, of Spokane, Wash., a civil engineer.

The sub-committee was told that all branches of engineering are coming to attach greatly increased importance to research. The hydraulic laboratory would do much to supplant rough and ready knowledge of hydraulic formulas and practice with exact knowledge, it was said. Mr. Harrington cited a number of specific cases in which there have been wide divergence of engineering opinion on fundamental problems in hydraulics.

Coal Commission's Report

In its effort to be absolutely fair and to avoid placing responsibility before the blame is proved, the President's Coal Commission has brought out a report which is certain to be a disappointment to the consumers of coal and to many members of Congress. It does not express an opinion as to whether or not current prices are just. It does not say whether or not the miners are receiving a higher rate of wage than the consumers should be called upon to pay. No one is accused of profiteering. The report indicates in a general way something as to the spread between the cost at the mine and the delivery cost of coal, but it gives no clue as to who is responsible. Labor, transportation, overdevelopment, storage, and other matters are discussed, but little is said about the business factors in coal.

Returning Alien Property

Majority sentiment in the House committee on interstate and foreign commerce apparently favors a considerable broadening of the terms of the pending Winslow bill to provide for the return to the owners of certain classes of trusts held by the Alien Property Custodian. Amendments to this end appear certain.

Briefly, the bill provides for the return of trusts valued at $10,000 or less, patents and trade-marks being excepted.

Committee sentiment appears to favor return of up to $10,000 of all trusts, regardless of size; the return of all Austrian and Hungarian trusts without any limitation on value, and the return of patents and trade-marks not involved in litigation with certain restrictions and limitations on some of them to meet views expressed before the committee by representatives of the War and Navy Departments. A minority of the committee members favor return of all trusts valued at $10,000 or less and of 50 per cent of the value of all larger trusts.

Thomas W. Miller, alien property custodian, testified before the committee that he favored return of trusts valued at $10,000 or less and of $10,000 of the value of larger trusts and of the return of all Austrian and Hungarian property. Col. Miller further expressed himself as favoring the return of all seized property at the earliest date consistent with public policy.

There are now held 28,144 trusts valued at $10,000 or less, according to the testimony of Col. Miller, and 2,224 trusts valued at more than $10,000. The alien property custodian estimated that the total cost of returning the smaller trusts would be $22,122,002. To add to this $10,000 for each of the larger trusts would cost $22,240,000.

In addition to the property held in trust by the alien property custodian, there remains to be an accounting for 126 ships valued at $34,000,000, Col. Miller testified.

The alien property custodian estimated the cost of returning all Hungarian property at around $2,000,000 and of all Austrian property at $8,000,000 or $9,000,000.

Business Items

The Builders' Iron Foundry, 9 Codding St., Providence, R. I., with a branch in New York City, has increased the capital stock from $250,000 to $600,000.

The Central Machine Works, 19 Central St., Worcester, Mass., machinist, etc., have recently purchased the business of the John J. Adams Machine Shop, 87 Mechanic St., Worcester, combining the two shops, and will operate the business at the plant located at 87 Mechanic St., in the future.

The J. M. Carpenter Tap & Die Co., Pawtucket, R. I., at a recent meeting, voted to increase its capital stock from $100,000 to $600,000. The firm was established in 1870, and is one of the oldest manufacturing concerns in Rhode Island.

The Screw Machine Products Corp., 1012 Eddy St., Providence, R. I., screw machine products, has recently filed a certificate with the Secretary of the State of Rhode Island, increasing the capitalization from $200,000 to $300,000.

The C. S. Mersick Co., large mill supply merchants, New Haven, Conn., has filed an increase in its capital stock from $500,000 to $1,100,000.

I. S. Spencer's Sons, Inc., Guilford, Conn., hardware, screw machine products, small tools, etc., has recently voted to increase the capital stock from $50,000 to $150,000.

A new machine which is said to be able to harvest cotton efficiently was recently exhibited at the William Penn Hotel, Pittsburgh, Pa. George R. Bennett is the inventor of the machine and he gave a demonstration for the benefit of government representatives as well as officials from England and Australia.

The Morse Chain Co., Ithaca, N. Y., has built a new factory in Detroit, Mich., which will employ 200 men. Recently the Morse Co. gave its 1,053 employes in Ithaca life insurance policies for Christmas presents.

It has been announced by the Northwestern Railroad that $7,000,000 would be spent to buy 3,000 new freight cars. This is one of the largest appropriations made for freight cars in some time and brings the total spent by this road on new equipment in thirteen months to $22,000,000.

Officials of the Bethlehem Steel Co. recently inspected the Cambria Steel Co., Johnstown, Pa. The party included Quincy Bent, vice-president in charge of operations at Bethlehem; Roy A. Lewis, general superintendent, Bethlehem plant; Timothy Burns, general superintendent, Lackawanna plant; F. A. Robbins, general manager, Steelton plant; J. P. Brock, general manager, Lebannon plant; W. F. Roberts, general manager, Sparrow Point, and Chief Engineer James of Lackawanna.

The Steele & Johnson Manufacturing Co., brass goods, brass chains, etc., of Waterbury, Conn., with branches in Chicago and New York City, has recently filed an increase in capital stock with the Secretary of the State of Connecticut, doubling its capital from $150,000 to $300,000.

The Bennett Metal Treating Co., Elmwood, West Hartford, Conn., recently incorporated to engage in the metal treating business, organized the past week by the election of the following officers: A. J. Germain, of Waterbury, Conn., president; Alvan L. Davis, of Waterbury, treasurer; and J. P. Germain, of Hartford, Conn., secretary.

The Blakeslee Drop Forging Co., New Haven, Conn., has been merged with the Blakeslee Drop Forging Co., Southington, Conn., and will, in the future, operate under the same name, with headquarters in Southington, where the plant will be located also. The company has incorporated under the laws of Connecticut, filing a certificate during the past week. The capital stock will be $600,000, and the incorporators are Dewey S. Blakeslee, James H. Pratt, and Cyrus C. Chamberlain. Each share of capital stock in the old companies will be exchanged for one share in the new company

A general conference of the sales staff of the Louis Allis Co., Milwaukee, was held at the plant recently and was attended by sales representatives and distributors from all over United States and Canada.

The Chamber of Commerce of Akron, Ohio, recently announced that the Farran-Kinney Co., Chicago, makers and distributors of automotive fan belts would locate in Akron in the near future.

The following changes of addresses have been made among the branches of the Northern Engineering Works, Detroit, Mich.: The new New York office will be room 623, 30 Church St., with H. C. Rood in charge; the Philadelphia office will be at 51 Estey Building, in charge of John H. Bricker, and the St. Louis office will be at 606 Pontiac Building in charge of J. S. Davidson.

The Hart & Cooley Co., manufacturers of registers, regulators, etc., of New Britain, Conn., has declared a stock dividend of 50 per cent, increasing their capital stock from $660,000 to $990,000.

A group of Canadian capitalists is seeking oil lands in Mexico and from information obtained from the representative it is certain that they will invest at least thirty million dollars American money.

Important Sessions Held by Federated Engineering Societies

Ambassador Caetani, Italy, Talks on the Relations Between United States and Italy and the Engineer's Mission— Committees Appointed and Resolutions Passed

FURTHER crystallization of the belief that engineers can render a real public service and that the Federated American Engineering Societies provides a workable medium through which engineers may unite in rendering such services, has resulted from the meeting in Washington, Jan. 11 and 12, of American Engineering Council.

The gathering of the representatives of the member societies was characterized principally by the trend toward furthering international relationships among engineers; by accentuating the need for the engineering colleges to train their students so that they may be qualified to assume leadership in public affairs and by providing for more active work looking to relief in the Patent Office; to the securing of adequate personnel for the Federal Power Commission; to a more comprehensive policy with respect to topographic maps and to a higher salary scale for technical men in the federal service.

Co-operation on an important scale is to be undertaken with the Forest Service in the matter of reforestation and with the Department of Commerce in the matter of types of government contracts. It was announced that the F.A.E.S. has all but concluded negotiations whereby it will undertake two new surveys which will be entirely comparable with those made on waste in industry and on the twelve-hour shift.

Caetani Proves Able Speaker

One of the most interesting features of the meeting was the banquet on Jan. 11, which was attended by ninety-one guests. On that occasion, the principal address was made by Ambassador Caetani, the engineer whom Italy has just sent to the United States to be near this government. Ambassador Caetani has conducted important activities in his professional capacity as both a mining and a civil engineer. Extracts from his remarks at the banquet follow:

"Some have made the remark in criticism that engineers lack politicial intuition and ability; I would answer that a larger dose of logic and positiveness applied to politics would bring great advantages to public affairs.

"Whatever the case may be, it is very agreeable that politics bear little weight in the relations between Italy and the United States. Between our two countries there has never existed political rivalry or serious commercial competition; our relations have been confined almost exclusively to contacts of labor, of engineering, of commerce, of science and of art.

"Much can be accomplished to the mutual advantage of our peoples; a large share of the success will depend upon the co-operation of the engineers and I know that I will always be able to rely on your good will."

Calvin Rice made the point during his talk at the banquet that an Ambassador who is an engineer is an ambassador of peace. Mr. Rice reported on his South American trip and urged interchange of engineering education between the United States and the countries of South America. He declared that Verne L. Havens has performed an invaluable service in bringing the engineers of Latin America and those of the United State closer together.

Elmer A. Sperry, inventor of the gyro-compass and ships' stabilizers, told of the progress being made by the engineering professions in Japan. He pointed out that there is much that American engineers can learn from members of their profession in the island empire. He called attention to the fact that British engineers are paying close attention to the progress being made in cerain lines of engineering in Japan.

During the course of the business sessions, some dissatisfaction was voiced with the conduct of the affairs of the Federated Societies. The point was made that member societies had too little voice in what was being done and some fear was expressed that an effort might be made to make a super-society of the Federation. It was pointed out by President Cooley and by L. W. Wallace, the executive secretary, that every effort has been made to conduct the Federation so that it would be a sort of House of Representatives—highly responsive to—and in no way dominating — constituencies. Certain other functions of the Federated Societies were likened to that of an embassy in Washington, representing member organizations. It was established that ample opportunity has been afforded to the membership of the member societies to acquaint themselves with all details of the Federation's activities. In the end, the difficulties were ironed out and the general discussion by members of the Council indicated a complete sympathy with the broad purposes of the Federation, but emphasized the need of devising every means possible to acquaint the individual engineer, as well as the member societies, with the work completed and problems to be undertaken by the Federation and its committees.

Executive Board Named

The executive board, in addition to the officers mentioned as it will be constituted in 1923, is as follows: American Institute of Electrical Engineers—C. G. Adsit, F. B. Jewett, William McClellan, L. F. Morehouse, C. F. Scott; American Institute of Mining and Metallurgical Engineers — Galen H. Clevenger, Charles H. MacDowell and Allen H. Rogers; American Society of Mechanical Engineers—L. P. Alford, A. M. Greene, Jr., John L. Harrington, Fred J. Miller and P. F. Walker; jointly representing American Society of Safety Engineers, American Society of Agricultural Engineers, Society of Industrial Engineers and American Institute of Chemical Engineers—M. G. Lloyd, S. H. McCrory and J. W. Roe; Regional directors—A. E. Lindau, Buffalo, N. Y.; W. H. Hoyt, Duluth, Minn.; Charles H. Gow, Boston Mass.; W. J. Fisher, York, Pa.; Erskine Ramsay, Birmingham, Ala.; L. A. Canfield, Des Moines, Iowa; O. H. Koch, Dallas, Texas, and J. C. Ralston, Spokane, Wash.

Patent Office Resolution

"Whereas, the recent increase in salaries in the Patent Office has largely stopped the resignations which were continuously depleting the upper grades of Examiners and has stimulated and improved the morale of the Examining Corps in general, but the number of cases received by the Patent office has steadily increased year by year, at a very rapid rate, during the three years between the drafting and the enactment of said bill, and has continued to increase very largely since the enactment of said bill, so that the present force of examiners and clerks is entirely inadequate to bring the work of the Patent Office up to date, and its physical facilities are so meager as to seriously impair the efficiency in operation of the present force:

"Now, therefore, the Council of the Federated American Engineering Societies, representing 55,000 engineers, respectfully requests that a Joint Commission be appointed by the Senate and House of Representatives to investigate the needs of the Patent Office, both as to personnel and physical equipment."

Bullard Enters Accessory Business

The automobile industry has been the largest customer in the history of the machine tool business and many new and radical machines have been developed for its use. On the list of these new machines the products of the Bullard Machine Tool Co., Bridgeport, Conn., hold a prominent place. Such intimate contact with the automotive industry has led this company to establish an automotive department and they have brought out four specialties as the beginning of a line of automobile accessories. These include a carburetor, a shock absorber and a clutch involving new principles, and a spring bumper. Each bears the name of Bullard.

Plans Twelve Branches

Plans have been made by E. A. Watkins, president of the Watkins Manufacturing Co., Wichita, Kan., to open new machine shops in twelve cities. At the present time there are four branches to the company, Indianapolis, Ind., Syracuse, N. Y., Waterloo, Iowa, and Kingston, Ontario, Can.

Book Reviews

Grinding; Wheels, Machines, Methods—Compiled by members of the Executive and Technical Staff of the Norton Co. 387 pages, 5 x 7¼ inches. Fully illustrated. Published by the Norton Co., Worcester, Mass. Price $1.

A book on grinding by such a staff of authors could hardly fail to be both interesting and valuable and a perusal bears out one's expectations in every way. The twenty-one chapters include a discussion as to the definitions and fields of grinding, information as to abrasives and the manufacture and selection of grinding wheels, grinding of various kinds such as tool and cutter work, precision grinding, surface and cylindrical grinding, crankshaft work, internal and form grinding, polishing and lapping and in fact all the types of grinding which now form part of our machining processes.

The properties and uses of various kinds of wheels, the reason for the different bonds, the kinds of abrasives and the grading of wheels receive careful attention. The effects of wheel speed, work speed, depth of cut and grades of wheel are also very thoroughly covered. The use of steady rests for supporting long cylindrical work is discussed fully and is amply illustrated. The book is full of meaty information which must be seen to be appreciated.

Hendricks Commercial Register of the United States—Published by S. E. Hendricks Co., Inc., 70 Fifth Ave., New York. 2,321 eight by eleven and one-quarter in. pages. Price $15.

This book is especially devoted to mechanical and technical interests and contains a reliable directory of manufacturers of and dealers in almost all conceivable articles related to these interests.

To the purchasing agent or any one who must answer questions as to who makes this, that or the other article, this book is invaluable.

From the number of letters received, asking for information as to manufacturers of certain articles, we are astonished at the comparatively few concerns having a copy of this book at hand. It is easily conceivable that many firms might spend more money in postage alone in writing for information contained in this book, than the book itself would cost.

In issuing such a book, the publishers have rendered a distinct service to the public, which should certainly be taken advantage of by all persons charged with responsibility for the sending of inquiries to or the ordering of goods from the proper concerns.

Tales from the Gangway. By Pat Dwyer. Four hundred fifty 6 x 9 in. pages, cloth boards, illustrated. Published by the Penton Publishing Co., Penton Bldg., Cleveland, Ohio. Price $3.

Occasionally there is found in the way of technical literature something that stands apart because of its unusual dress or style of presentation. Such were "Chordal's Letters," published in *American Machinist*, and such is "Tales from the Gangway."

The author introduces us to "Bill," who knows the foundry and knows it well. And Bill does most of the talking, very entertainingly, mixing up his foundry lectures with glimpses of his family, friends, acquaintances, and even strangers. Humorous illustrations, well conceived and executed, are scattered through the text.

There are 60 chapters in which Bill gives information on many subjects, among them open sand plates, cupola methods, method of pouring bushings, collecting scrap, making small chilled wheels, regulating tuyere area, importance of properly mixing sand, need of trained molders, causes of defective castings, pattern mounting methods, and details of flasks and arbors.

The Welding Encyclopedia. Second Edition. Edited by L. B. Mackenzie and H. S. Card. Three hundred eighty-eight 6 x 9 in. pages, black flexible covers. 550 illustrations. Published by the Welding Engineer Publishing Co., 608 South Dearborn St., Chicago, Ill. Price $5.

The first 140 pages comprise a dictionary of words, terms and trade names used in the welding industry. However, the treatment given many terms is fuller than that accorded in the average dictionary, complete instructions being included for some welding operations. There are, also descriptions of modern methods of testing welds, specifications for welding rods and wires, and descriptions of the application of welding to the various industries.

A chapter on electric arc welding follows the dictionary. Then follow chapters on electric resistance welding, oxy-acetylene welding, and thermit welding. Complete descriptions of each of these processes are given, followed by general operating instructions and special instructions for the application of each process.

Sections are devoted to boiler, pipe, tank and rail joint welding. A section gives the rules and regulations enforced by Federal and State authorities and insurance companies on the construction, installation and operation of welding equipment and on their application to various structures. The heat treatment of steel is dealt with, charts and tables show methods of preparing joints for welding, colors of metals at different temperatures, and the adjustment of the oxy-acetylene flame. The catalog section at the end of the book shows welding equipment and apparatus.

Engineering Workshop Handbook. By Ernest Pull, chief instructor and lecturer at the London County Council School of Engineering, Poplar, London, England. Fifth edition, 175 pages, 4¼ x 6½ in. 150 illustrations, brown cloth-board covers. Published by D. Van Nostrand Co., 8 Warren St., New York, N. Y. Price, $5.

This book may well serve as an instruction text for apprentices and others beginning work in machine shops, and it is also of sufficient scope to be of use as a reference book on the subject of machine shop practice. It is a revised edition of the "Munition Workers' Handbook," and contains material on subjects not covered in the previous editions. The pocket size of the book makes it convenient to carry and handy for use at the bench or machine.

The book is naturally written with particular attention to practice in English machine shops. The treatment of each subject is necessarily brief, but it is much to the point and gives a good outline of facts that a mechanic in any particular line should know. The book begins with general matter on such subjects as mathematics and materials, and then goes into detail on the operations incident to running various types of machines and performing work in machine shops. Tables and rules of especial use to the mechanic are to be found throughout the volume.

The scope of the work can be shown by the chapter heads, which read as follows: Workshop Arithmetic, Mensuration and Geometry; Materials; Heat-Treatment of Metals; Common Workship Tools; Measuring Tools and Gages; Lathe Work and Turning; Lathe Tools; Screw Cutting; Drilling, Tapping, and Screwing; Bench Work; Planing and Shaping; Milling Machines and Milling; Gear Cutting; Precision Grinding; Tapers and Taper Turning, and Tables, Rules, and Notes.

American Machinist Gear Book. By Charles H. Logue. Revised by Reginald Trautschold. Third edition, second impression. Three hundred forty-eight 6 x 9 in. pages, cloth boards, illustrated. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York. N. Y. Price, $3.

To bring the gear book up to the minute, the second edition has been revised and enlarged. Parts of the original work no longer of particular value to the practical man have been omitted. Additions consist of sections devoted to varieties of bevel gears, spiral type bevel gears, and bevels of the Williams "master form" variety; to an exposition of the Williams system of internal gearing; and to the first presentation in book form of the successful development of the rolling process of gear production.

The sections on "costs" and "practical points in gear cutting" have been omitted, the former on account of complications in direct comparison of costs brought about by developments in a variety of production processes, and the latter on account of the increased prominence of the process of gear generation, a field in which the hints on gear cutting would be of little value.

The book contains simplified tables and formulas for designing, and practical points in producing all commercial types of gears. The sixteen sections into which it is divided have for their subjects: tooth parts, spur gear calculations, speeds and powers, gear proportions and details of design, bevel gears, worm gears, helical and herringbone gears, spiral gears, skew bevel gears, intermittent gears, elliptical gears, epicyclic gear trains, friction gears, special bevel gears, Williams system of internal gearing, rolled gearing.

Working of Steel. By Fred. H. Colvin and K. A. Juthe. Second edition, second impression. Two hundred thirty-eight 6 x 9 in. pages, cloth boards, illustrated. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price, $3.

A practical book on the annealing, heat treating and hardening of carbon and alloy steels. In this revision, the portions of the book relating to the modern science of metallography have been extensively revised. Much of the matter relating to the influence of chemical composition upon the properties of alloy steels has been rewritten. Notes have been included on methods of physical testing.

The first chapter treats of the bessemer, open hearth, crucible and electric furnace methods of making steel. It also provides a classification of steels and a table of their common uses. The other chapters take up the composition and properties of steels, alloys and their effect upon steel, application of Liberty engine materials to the automotive industry, the forging of steel, annealing, case hardening or surface-carburizing, heat-treatment of steel, hardening carbon steel for tools, high-speed steel, furnaces, pyrometers and pyrometry.

There is an appendix giving tables on temperature conversion, comparison between degrees centigrade and degrees Fahrenheit, weight of round, octagon and square carbon tool steel per ft., weight of round carbon tool steel 12 in. in diameter and larger per ft., and decimal equivalents of a foot.

Obituary

WILLIAM W. MACFARLANE died recently at his home, Elkins Park, near Philadelphia. Mr. MacFarlane was an inventor having perfected a device for preventing railroad wrecks, the device that permitted telephonic communication between a stationary object and a moving train and other useful inventions.

FRANCIS J. COLE, aged 65 years, died recently at Pasadena, Calif. Mr. Cole was a consulting engineer with the American Locomotive Co., Schenectady, and had been connected with that company since 1902. Previous to that time he was with the Baltimore & Ohio Railroad and the Rogers Locomotive Works, Paterson, N. J.

ABBOTT L. JOHNSON, aged 71 years, president of the Warner Gear Co., Muncie, Ind., died recently at his winter home, Daytona, Fla. Mr. Johnson has been the president of the gear company for several years.

Trade Notes from Mexico

Veracruz, where merchandise was heaped on the wharfs owing to the strike, has become the thieves' harvesting place. Ingenuity, craft and expedition are employed by the light-fingered gentry to relieve the weight of merchandise on the wharfs. In one case a remission of port wine of 250 bottles, 200 were found empty. The merchants at Veracruz are said to be not particular how they get the goods others have ordered. The thieves sell much cheaper.

By order of the Government a tax of ten per cent on all freight and passenger service will be charged. The charge begins on the first of the year.

Mexico expects to import from the United States during the months of April to September of 1923, about twenty million pesos worth of cotton.

Telegraph tolls in Mexico, it is announced, will be reduced about 25 per cent during the coming year.

Personals

MARVIN E. MONK, Chicago, has been made Director of Sales for the U. S. Ball Bearing Manufacturing Co., Chicago, manufacturer and distributor of high-grade ball bearings. Mr. Monk has, for some time past, been Assistant Sales Manager of this company.

O. B. ILES, president of the International Machine Tool Co., Indianapolis, Ind., has been named chairman of the manufacturers' committee of the Indianapolis Chamber of Commerce.

P. E. MONTANUS of the Springfield Machine Tool Co., Springfield, Ohio, after several weeks in Florida with his wife and daughter, arrived in New York January 20 to stay at the Hotel Imperial for a few days. On January 24, Mr. Montanus and his family sail on the Samaria for a cruise around the world.

E. M. RHODES has resigned as president and treasurer of the Sanitary Co. of America, Linfield, Pa., to become the president and treasurer of the Eastern Foundry Co., Boyertown, Pa. Associated with Mr. Rhodes in the new company are B. W. Frederick, formerly with the Keystone Supply and Manufacturing Co., Philadelphia, Grant T. Bechtel, formerly with the Sanitary Co. of America, Daniel G. Burkert, formerly with the Union Manufacturing Co., Boyertown, and Harry R. Trout, formerly with the Sanitary Co. of America.

BRENDON PAUL LYONS, for several years New England representative for Robert K. Greaves & Co., Boston, has resigned to become general sales manager for the DeBats Metals Co., Bloomfield, N. J. His headquarters will be in New York City.

CHARLES N. REPLOGLE, for 27 years manager of the Cambria Steel Co., Johnstown, Pa., and from 1913 to 1917 vice-president and general manager of the Ralston Steel Car Co., Columbus, Ohio, has been elected president and general manager of the Brightman Manufacturing Co., Columbus, Ohio, manufacturers of shafting and straightening machinery. Mr. Replogle, following his connection with the Ralston Co., was vice-president and general manager of the Symington Forge Corp. Rochester, N. Y., during the war engaged in the production of munitions. Later he was manager of the Columbus, Ohio, plant of the Timken Roller Bearing Co.

JOHN P. GERMAN, for eight years with the Scovill Manufacturing Co., Waterbury, Conn., in charge of the hardening department, has accepted the position of manager of the Bennett Metal Treating Co., Elmwood, Conn.

JOHN H. BARR has announced that he is now connected with the organization known as the Barr-Morse Corp., 149 Church St., New York City.

FRANK W. TRABOLD has been elected president of the Western Drop Forge Co., Marion, Ind.

O. P. HATTON has joined the Bridgeport Brass Co., organization, Bridgeport, Conn., as Publicity Manager.

IVAR L. SJOSTROM, president of the Manufacturers' Machine Co., North Andover, Mass., machinery, sailed from New York City, December 30th on the steamer Olympic for a business trip in England and France.

R. W. VALLS, vice president and consulting engineer of the Champion Engineering Co., Kenton, Ohio, has resigned.

T. A. MARTIN becomes general superintendent of the Farrell Cheek Foundry Co., Sandusky, Ohio, February 1. He has been with the George H. Smith Steel Castings Co., Milwaukee, Wis., for many years.

HENRY EVANS has been named general superintendent of the Central Iron & Steel Co., Harrisburgh, Pa., to succeed Robert M. Keeney. Mr. Keeney becomes the general superintendent of the Pittsburg Crucible Steel Co.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Railway supplies of all kinds for reconstruction work. Rumania. Agency. Quotation c.i.f. Rumania port. Reference No. 4984.

Machinery for the manufacture of paper. Italy. Agency and purchase. Reference No. 4996.

Machinery and material for the printing trade including newspaper publishing. Ceylon. Purchase. Quotation c.i.f. Ceylon port. Reference No. 4999.

A centrifugal machine with a force of 17,000 revolutions per minute and a capacity of 25 liters per minute for separating dirt from benzine. Spain. Purchase and agency desired. Quotation c.i.f. Corunna or Vigo. Terms; payments against documents. Correspondence, Spanish. Reference No. 5001.

Presses for making impressions of silver sheets from brass molds; rolling mill for making sheet silver from melted metal, and goldsmiths' and silversmiths' tools and machinery. South India. Purchase. Quotations c.i.f. Madras. Catalogs requested. Reference No. 5002.

Machinery for rice and corn cleaning, polishing, etc., of a capacity of 100 bags of 75 kilos per day of eight hours. Brazil. Purchase. Quotations c.i.f. Brazilian port. Reference No. 5005.

Aluminum circles and sheets and rods of various gages for the manufacture of aluminum utensils. South India. Purchase. Quotations c.i.f. Indian port. Terms, cash. Reference No. 5006.

Complete shoe repairing outfit including a sole-sewing machine, finishing bench, and supplementing hand power machines for channel opening, etc. Spain. Purchase. Reference No. 5016.

Machinery for making all sizes of buttons from ivory nuts and coroza nuts and also from shells. Brazil. Purchase. Quotations f.o.b. New York. Correspondence, Portuguese. Catalogs also desired. Reference No. 5019.

Machinery for the extraction of cotton seed oil for soap making, for glycerine refining, glycerine separation and for the manufacture of compound lard. Mexico. Purchase. Catalogs and price lists desired. Reference No. 5028.

Cigarette making machinery of a capacity of 40,000 cigarettes per day. Nicaragua. Purchase. Quotations f.o.b. American port. Reference No. 5031.

Tools and machines for tinsmiths, galvanized sheet iron, copper, etc. Norway. Purchase and agency. Quotations c.i.f. Norwegian port. Payment arranged through banks in New York. Reference No. 5046.

Wood and metal working machines. Austria. Agency. Quotations c.i.f. Hamburg. Reference No. 5049.

Machine tools and excavating and construction machinery. Poland. Agency. Quotations c.i.f. Danzig. Reference No. 5051.

Pamphlets Received

Direct Current Motors and Generators. The Burke Electric Co., Erie, Pa. Bulletin No. 126 just issued by this company, contains a complete description with numerous illustrations of direct current motors and generators.

Statistics of Agricultural and Mechanical Colleges for 1919 and 1920. Department of the Interior, Bureau of Education Bulletin No. 27, 1922, by Walton C. John.

Sweden. Trade and Economic Review for 1921, No. 22, on the status of trade in Sweden. Published by the Bureau of Foreign and Domestic Commerce.

Uruguay. Trade and Economic Review for 1921, No. 23, on the status of trade in Uruguay. Published by the Bureau of Foreign and Domestic Commerce.

Spain. Trade and Economic Review for 1921, No. 21, on the status of trade in Spain. Published by the Bureau of Foreign and Domestic Commerce.

Mexico. Trade and Economic Review for 1921, No. 20, on the status of trade in Mexico. Published by the Bureau of Foreign and Domestic Commerce.

Structure of Martensitic Steels and Changes in Microstructure which occur upon Tempering, by Henry S. Rawdon, physicist, and Samuel Epstein, assistant physicist, of the Bureau of Standards; known as scientific paper No. 452, published by the Bureau.

Forthcoming Meetings

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies' Bldg., New York. F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., February 8 and 9, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers. Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

Philadelphia A.S.M.E. and **Philadelphia A.I.E.E.**, Joint meeting February 27 at the Philadelphia Engineers Club. Afternoon, dinner and evening sessions. Louis H. Kenney, Meetings committee, U. S. Navy Yard, Philadelphia, Pa.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., April 25 to 27, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

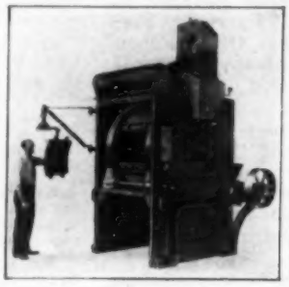
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Sandblasting Machine, Barrel-Type, Large

Pangborn Corporation, Hagerstown, Md.

"American Machinist," November 23, 1922

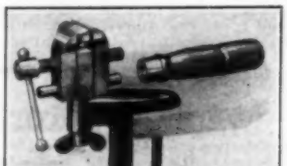


The machine is for cleaning work by means of a sandblast. It can be furnished with drums of two sizes, one 30 x 40 in., and the other 50 x 40 in. The nozzles in the machine are made adjustable both horizontally and vertically, since the cleaning capacity is governed by the distance of the nozzles from the work and their angle to the work. A mechanical separator gives constant separation of the abrasive for reuse. The barrel is reinforced at the door opening, with plates and angles both inside and out. The chain of the driving sprockets runs in a bath of oil, inclosed to exclude dust. The clutch engaging the motion for the drum is simple and positive in its action.

Vise, Combination, Hand and Bench

L. S. Starrett Co., Athol, Mass.

"American Machinist," November 23, 1922



The general utility vise is suitable for both hand and bench operation. A large strong clamp is furnished for use when the tool is employed as a bench vise. It can be attached to benches ½ to 2½ in. thick. The construction is such that the vise can be adjusted to any position throughout a complete circle, and then locked. A ball-end handle is used for tightening the jaws, instead of a wing nut, bringing into play a large leverage. The jaws of the vise are tempered and polished drop forgings, 1½ in. in width, providing a maximum opening of about 1½ in. for the vise.

Boring Machine, for 6 to 12½-Inch Pipe Couplings, Automatic

Bullard Machine Tool Co., Bridgeport, Conn.

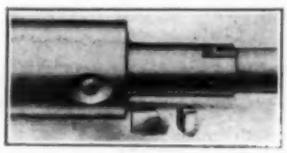
"American Machinist," November 23, 1922

The machine is capable of taper-boring, counterboring, facing to length and chamfering both ends of a coupling simultaneously, and of automatically loading and discharging the coupling. It is self-contained and is driven by two independent variable-speed motors of 25 and 5 hp. A supply of air at a pressure of 75 to 80 lb. per square inch is required for holding the work between the chuck jaws. Two sliding heads have a longitudinal movement upon the bed. During the slow advance of the heads when the tools are at work, the camshaft is driven by the main driving motor, and the rate of feed automatically corresponds to the speed of rotation of the cutters. After the tools have completed their cuts, the secondary motor finishes the movements of the machine.

Boring Bar, Expansion

Manufacturers' Equipment Co., Waller Ave. and Fillmore St., Chicago, Ill.

"American Machinist," November 23, 1922

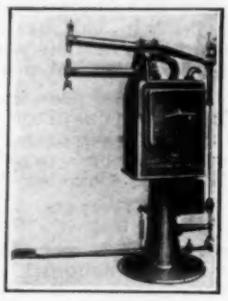


The cutters can be removed from the bar after setting and replaced or may be changed to opposite sides of the bar without variation from size. Micrometer adjustment is provided, each revolution of the dial indicating an expansion or contraction of the cutters equal to 0.010 in. As the cutters are moved outward, thrust is taken by the solid body of the bar. A radius on the back of each cutter fits into a corresponding seat in the body of the bar. The locking mechanism consists of a tapered screw which forces a clamping block against the cutters. The cutter blades can be furnished in any kind of material. The mechanism is entirely inclosed in the bar. Bars from ¾ in. up in any size can be furnished.

Welding Machine, Electric, "U. S."

U. S. Electric Welder Co., 327 Permanent Bldg., Cleveland, Ohio

"American Machinist," November 23, 1922



The welding machine, for use on light and medium work, can weld rough oxidized as well as smooth stock. It is made in two sizes, having kilovolt-ampere capacities of 12.5 and 18, and horn sizes of 2 and 2½ in., although various lengths of horn can be furnished. The internal automatic reaction prevents breakdown and overload. The inclosed automatic switch is equipped with a magnetic blowout and removable contacts. A 5-point pivot switch provides for different voltages at the welding point. The welding points are water-cooled. Pressure is placed on them by means of the treadle at the front of the machine acting through a system of links.

"Duraloy," Chrome-Iron Alloy

Cutler Steel Co., Pittsburgh, Pa.

"American Machinist," November 23, 1922

The alloy is highly resistant to oxidation, corrosion and abrasion, and possesses other properties that adapt it to special uses. It can be furnished commercially in practically every form, including castings, rolled or forged bars, sheets, wire and tubing. The physical properties can be made to suit the conditions, varying with the composition, treatment and method of manufacture. The metal contains a high proportion of chromium, the content being varied according to the properties desired. The Brinell hardness of the alloy can be varied from 170 to 600; the ultimate tensile strength of the cast alloy from 40,000 to 90,000 lb. per square inch, and of the rolled or forged alloy from 80,000 to 130,000 lb. per square inch. Duraloy can be welded by either the oxy-acetylene or electric arc methods, but cannot be hammer welded. As it will resist oxidation up to 2,100 deg. F., it is adapted for gratings, doors and counterweight chains used in furnaces. The alloy will resist atmospheric and salt corrosion, as well as molten cyanide and heat-treating salts. Its properties in respect to abrasion make it adapted to such uses as in balls and races and for grinding, extrusion and drawing dies.

Rust Remover and Pickling Compound, "Commercial"

Peter A. Frasse & Co., Inc., 417 Canal St., New York, N. Y.

"American Machinist," November 23, 1922

The preparation is used to remove rust and corrosion on all metals, as well as in sulphuric acid baths for pickling purposes. When cleaning metals, one part of the rust remover to twenty-five parts of water is sufficient to loosen and remove any rust. The parts are immersed in such a bath and are not heated nor scraped. The rust remover does not consume nor attack the metal itself as its action is entirely confined to removal of the rust and corroded portions. The same solution can be used repeatedly by adding a little of the compound. The compound is not inflammable nor explosive. It is of particular use also in plants employing sulphuric acid and hydrochloric acid baths for removing scale. By the addition of 1 or 2 per cent of the compound to the bath, the formation of hydrogen is prevented. The presence of the compound neutralizes the action of the sulphuric acid bath in consuming the metal already freed from scale. It also lessens the damage done to the equipment and eliminates objectionable fumes from the bath. The compound may be furnished in quantities as small as one pint.

Lathe, Engine, Heavy-Duty, 60-Inch

Niles-Bement-Pond Co., 111 Broadway, New York, N. Y.

"American Machinist," November 30, 1922

The machine is fitted with either a constant-speed 40-hp. motor or an adjustable-speed direct-current motor, and has twenty-four faceplate speeds obtained by change gears. When an adjustable-speed direct-current motor is used for driving, the geared speed changes in the head above the joint line are eliminated without reducing the speed range of the faceplate. A push-button on the headstock is used for "jogging" the driving motor to give quick and easy shifting of the speed-change gears. The tool carriage has lateral, cross and angular power and hand feeds, and also a rapid traverse along the bed operated by a 5-hp. motor, and controlled through a handle on the carriage. The direction of any feed may be changed and started and stopped at the carriage. A quick-change gear box gives four feeds.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Ala., Bay Minette—O. Ertzinger—metal working machinery and equipment.

Ill., Chicago—Mchy. Products Corp., 231 West Illinois St., (machine shop and sales room)—screw machine, belting, pulleys and equipment.

Ill., Waukegan—Sheridan Road Co-operative Garage, Sheridan Rd.—automobile repair machinery, including drill press and grinder.

Ky., Louisville—Summers Hermann Co., 906 South 3rd St.—machinery and tools for proposed $125,000 garage and automobile service station.

La., New Orleans—R. G. Holzer Estate, Burgundy St. near Iberville St., J. Holzer, Purch. Agt.—one 45 ft. swing upright machine to handle ¼ to ¾ holes in slate, Hoefer Mfg. Co. or equal; one 3 hp. 220 volt d.c. buffer and polishing machine United States Electrical Tool Co. or equal; one No. 3 punch shear and rod cutter, Union Mfg. Co. or equal; one No. 2 U. bender complete with stand for making U and Z bars, Wallace Supply Co. or equal; one No. 2 horizontal tapping machine, Garvin Machine Co. or equal (new or used).

Md., Baltimore—National Pipe & Nipple Co., Inc., 621 Whitridge Ave., J. S. Clark, Purch. Agt.—pipe cutting and threading machinery, also pipe in carload lots.

Md., Cumberland—F. C. Dryer, Box 200—16 or 18 in. swing lathe, 9 or 10 ft. between centers (used).

Mass., Lowell—R. W. Duff, South Wildee St.—small garage repair equipment.

Mich., Saginaw—Miles Mchy. Co., 208 Bearinger Bldg.—Iron and woodworking machinery and tools, including lathes, chucks, planers, etc.

Minn., St. Paul—Robinson, Carey & Sands—screw cutting lathe, 19 in. between centers (used preferred).

Mo., St. Louis — Dean Metal Co., W. Denkel, Vice Pres. and Factory Mgr.—machine shop equipment and several punch presses for the manufacture of sheet metal specialties.

N. Y., Brooklyn — F. C. O'Dougherty Mfg. Co., 650 Bedford Ave., (boilers)—one radial drill, 3 to 5 hp.; one pipe threader, 1 to 4 in. pipe; one floor grinder, 10 or 12 in. wheel.

N. Y., Buffalo—A. Schellinger, 648-650 Elliot St.—garage and repair shop equipment.

N. Y., Carthage—A. Gormley & Co., Inc., Water St., (machine shop, plumbing, heating and garage), G. Gormley, Purch. Agt.—sheet metal working tools, power operated, electrically driven.

N. Y., Gouverneur—Whitney Garage Co., Inc., D. M. Hazelton, Purch. Agt.—one 16 in. lathe (new or used), also acetylene welding equipment for light work.

N. Y., New York—J. Frins, 2511 8th Ave. (boiler maker)—screw cutting lathe, 11 to 13 in. swing, 4 ft. bed.

N. Y., New York—F. L. Smithe Machine Co., 11th Ave. and 21st St.—lathes, drill presses, etc., for proposed machine shop on 12th Ave. and 44th St.

N. Y., Watertown—James Inc., Factory St., B. N. James, Purch. Agt.—complete machine tool equipment for garage and machine shop at Canton.

N. C., Charlotte—Hipp Chevrolet Co., 500 North Tryon St., A. Hipp, Purch. Agt.—lathe, drill press and all other tools for automobile service station.

O., Cleveland—The Sabin Machine Co., 6536 Carnegie Ave.—No. 21 Bliss punch press, or similar (new or used).

O., Columbus—Ohio Elevator & Machine Co., Jefferson and Curtis Aves., H. R. Burton, Secy. and Treas.—one 24 in. lathe, one shaper and two milling machines.

O., Columbus—Ohio Motors Co., 207 East Broad St., L. S. McPhail, Mgr.—equipment for automobile service station, including one drill press and probably small lathe.

O., Columbus—Ohio State Stove & Mfg. Co., foot of Buttles Ave., W. H. Packer, Supt.—two drill presses, one cutter and other machinery.

Pa., Bakerton (Elmora P. O.)—Sterling Coal Co.—machine shop equipment, mechanical fan blowing system and coal tipple equipment.

Pa., Phila.—General Radio Corp., 1310 Callowhill St.—3 spindle drill press, speed lathe, grinding machine and one 3 jaw 10 in. chuck.

Pa., Reading—Reading Hardware Co.—foundry and machine shop equipment.

Pa., Scranton—Dept. Public Safety, W. Vanston, City Hall, dir.—receiving bids one lathe for auto repair shop of Bureau of Fire.

Tex., Big Spring—W. E. Carnrike, (machine shop)—22 or 24 in. lathe and 20 in. drill press.

Va., Norfolk—Sea Board Air Line Railway, W. H. King, Jr., Purch. Agt.—machinery and equipment for locomotive repair shop at Charleston, S. C.

Va., Richmond—Corner Motor Co., 1639 West Broad St., G. D. Corner, Purch. Agt.—lathe, drill press and other tools.

Va., Richmond—W. R. Leake, 203 East Cary St.—key machine, small lathe and small bench vise.

Va., Richmond—W. R. Newcomb, 1012 East Broad St.—bench tools for automobile repair work.

Va., Richmond—Richmond Lock Shop, 418 East Grace St.—small lathe and emery wheels.

W. Va., Clarksburg—J. W. Jacobs, c/o Montecello Supply Co.—welding and cutting equipment, milling machine, shaper, lathe and drill press.

W. Va., Martinsburg—L. J. Freeze—machine shop equipment.

Wis., Janesville—Hayes-Fountain-Hayes Co., Hayes Bldg., (paving contractors)—machinery and equipment for small machine shop.

Wis., Milwaukee—Mullins Body & Tank Co., 382 4th Ave. (auto truck bodies and steel tanks), C. J. Mullins, Purch. Agt.—one riveting hammer; one set of rolls 8 ft. long having 3 in. rolls; one set rolls 10 or 12 ft. long having 6 in. rolls; combination punch having 36 in. throat and equipped with angle shear and bar attachments; one 12 ft. brake; one 12 ft. shear to shear ¼ in. plate; one bevel shear; one serpentine shear; 10 x 10 air compressor (all with individual motors).

Wis., West Allis—Burbach Service Station, 5225 Greenfield Ave.—repair shop machinery, including lathe and drill press for proposed $40,000 garage.

Ont., Ford—Merlo, Merlo & Ray (contractors)—equipment for $30,000 machine shop and garage.

Ont., Jarvis—McCarter & Allen—equipment for garage and automobile repair shop.

Ont., London—City Council, G. Wenige, mayor, City Hall—equipment for proposed garage and repair shop.

Que., Montreal—Century Electric Co., 623 St. Paul St. W., (machinists, etc.)—lathe and other small tools.

Que., Montreal—H. Wusy, 330 4th Ave., Rosemount—machinery and equipment for machine shop, garage and automobile repairs.

Que., Verdun—W. Barrette, 453 Church Ave.—machinery and tools for garage repair shop.

Machinery Wanted

Ala., Holt—Central Fdry.—equipment for department for the manufacture of high pressure cast iron water pipe.

Ala., Sylacauga—Madras Marble Co.—grinding and polishing machinery.

Ark., Little Rock—Western Newspaper Union—linograph.

Ark., Star City—Ozark Timber & Stave Co.—machinery and equipment for stave mill, to replace that which was destroyed by fire.

Calif., San Bernardino—Economy Print Shop, 465 H St.—power cutter and wire stitcher.

Del., Selbyville—Delaware Light & Ice Co.—ice manufacturing machinery.

Ga., Atlanta — United Paper Co., 3rd Natl. Bank Bldg. (manufacturer of fruit wrapping papers)—machinery and equipment for 5 story addition to plant.

Ill., Chicago—D. & G. Mfg. Co., 3001 La Salle St.—34 in. printing press, power attachment.

Ill., Chicago—Liddell & Co., 2900 West Lake St.—one chain drawn bench about 23 ft. grip length, pulling capacity about 15,000 lb.

Ill., Chicago—Stocker Rumely Wachs Co., 117 North Jefferson St., (machinery)—shear for cutting 1 in. plate.

Ill., Freeport — Arcade Mfg. Co., 1212 East Shawnee St.—woodworking machinery.

Ill., Lakewood—E. G. Munson, (automobile and tractor repairing)—power emery stand with tight and loose pulley, also dynamo and kerosene engine.

Ill., Sorento—Home Bakery—automatic bread wrapping machine for power attachment.

Ind., Albion — Democrat — power saw, motor and belting.

Ind., Cannelton—Cannelton Sewer Pipe Co.—electric vibrating screen; 44 x 60 in. press; two gravity elevators; steam hydraulic elevator; conveyor, 179 ft. long, running at a 12 degree angle.

Ind., Kokomo—J. Hersberger—newspaper equipment.

Ind., Wabash—R. J. Evans—special machinery and equipment for the manufacture of composition roofing products.

Kan., Fort Scott—A. W. Winter, 209 South Margrove St.—oil pump, air pump and oil tank motor.

Kan., Wichita—Conway Springs Water Co., 223 South Wichita St.—bottling machinery, belting and pulleys for proposed plant.

Ky., Louisville—Louisville Ry. Co., 314 West Jefferson St.—car shop equipment, to replace that which was destroyed by fire.

La., Carson—Delta Land & Timber Co.—saw and lumber mill equipment, to replace that which was destroyed by fire.

Mass., Attleboro—Watson Co.—power diamond cutter for job printing.

Mass., Boston—P. H. Horan Co., 634 Harrison Ave. (metal worker)—planer, 6 ft. bed, (used).

Mass., East Boston (Boston P. O.)—Suffolk Knitting Mills, 8 New St., (manufacturer of sweaters)—several bottle bobbins for Payne rewinders, 6 in. base, 17 to 19 in. high (used).

Mass., Hyannis—J. Hinckley & Son Co., (millwork and lumber)—lumber mill equipment for new mill; also small equipment for garage repair work.

Mass., Medford—Amer. Woolen Co., 180 Boston Ave., J. Cutler, Purch. Agt.—machinery for new mill on Boston Ave. and North St.

Mass., Roxbury (Boston P. O.)—Carters Wet Wash Laundry, 13 Allerton St., laundry machinery, including washing machines, ironers, pressers, etc. (used).

Mass., Somerville — P. P. Piovrde Refrigerator Co., 15 Glen St.—single drum sander (used).

Mich., Cheboygan — Cheboygan Brass Fdry.—foundry equipment to replace that which was destroyed by fire.

Mich., Crystal Falls—Diamond—newspaper equipment.

Mich., Ionia — Michigan Reformatory — sewing machines, etc., for clothing factory.

Minn., Centerville (Hugo P. O.)—West Prairie Flour Mill—grain crushing and flour grinding machinery.

Miss., Picayune—Bd. Educ.—vocational equipment for $75,000 school.

Mo., Kansas City—Ever Bright Stone Co., 201 West 20th St.—sheet metal brake and meta. shear.

Mo., St. Louis—Bantle Printing Co., 3518 Easton Ave., J. E. Bantle, Purch. Agt.—cylinder printing press, 38 in. or over.

Mo., Windsor—Review—two revolution, trip and back up power newspaper press, 24 x 36 in.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—A minimum of $2.10 per 100 lb. quoted on steel shapes and plates, f.o.b. Pittsburgh. Mill capacity rapidly filling up with heavy tonnage orders for railway and building materials, also plates for boiler, oil tank and ship construction. Minimum on bars, however, still placed at $2. Steel mills working at about 85 per cent of capacity. Unfilled orders on books of United States Steel Corporation, Dec. 31, 1922, totaled 6,745,703 tons, a drop of over one per cent in month. Iron and steel scrap prices higher; coke steady. No. 2 foundry pig-iron up $2.50 and basic, $1 per ton at Pittsburgh. Lead market very strong; price up 10c. per 100 lb., in week, at New York warehouses. Linseed oil, raw, in 5 bbl. lots, 93c. as against 90c. per gal., f.o.b. New York.

Declines—Zinc down $1 per ton; due largely to falling off in exports. Copper market weaker. Tin, 39⅝c. as compared with 40¼c. per lb., one week ago, in New York warehouses.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	29.27
Southern Ohio No. 2	29.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.76
Virginia No. 2	33.17
Basic	28.00
Grey Forge	28.00
CHICAGO	
No. 2 Foundry local	29.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	28.00
Basic	26.00
Bessemer	27.50

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6
Cincinnati	4.5@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.60@2.70	4.19	3.50	4.00
No. 12	2.70@2.80	4.24	3.55	4.05
No. 14	2.80@2.90	4.29	3.60	4.10
No. 16	3.00@3.10	4.39	3.70	4.20
Black				
Nos. 17 and 21.	3.20	4.30	4.05	4.70
Nos. 22 and 24.	3.25	4.35	4.10	4.70
Nos. 25 and 26.	3.30	4.40	4.15	4.75
No. 28	3.35	4.50	4.25	4.85

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.35@3.50	4.50	4.15	4.85
Nos. 12 and 14.	3.45@3.60	4.60	4.25	4.95
Nos. 17 and 21.	3.75@3.90	4.90	4.55	....
Nos. 22 and 24.	3.90@4.05	5.05	4.70	5.40
No. 26	4.05@4.20	5.20	4.95	5.55
No. 28	4.35@4.50	5.50	5.25	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66	54½	⅜ to 1¼	34	19
		LAP WELD			
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	64	53½	⅜ to 1¼	34	20
2 to 3	65	54½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded.	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	4.00	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.50		12@13
⅛	7.00		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York				15.37½
Tin, 5-ton lots, New York				39.62½
Lead (up to carlots), St. Louis	7.65;	New York	8	27½
Zinc (up to carlots), St. Louis	6.90;	New York	7.30	

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	25.00	23.00
Antimony (Chinese), ton spot	7.90	8.25	7.25
Copper sheets, base	23.50	22.00	23.00
Copper wire (carlots)	16.62½	18.75	16.25
Copper bars (ton lots)	20.50	22.75	19.50
Copper tubing (100-lb. lots)	25.25	25.75	23.00
Brass sheets (100-lb. lots)	19.00	21.25	18.75
Brass tubing (100-lb. lots)	23.50	24.25	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.50	15.75
Brass wire (carlots)	19.50	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	29.00	26.25	20.00
Babbitt metal (83% tin)	42.00	49.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.75	12.25
Copper, heavy, and wire	12.25	12.00	11.75
Copper, light, and bottoms	10.50	10.50	11.00
Lead, heavy	5.75	5.50	6.00
Lead, tea	5.25	4.50	4.75
Brass, heavy, yellow	7.00	....	....
Brass, heavy, red	9.50	10.00	9.50
Brass, light	6.00	6.00	6.50
No. 1 yellow brass turnings	7.00	7.00	7.50
Zinc	4.50	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
X,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11½	$0.13	$0.11½
Cotton waste, colored, per lb.	.08½	.10	.08
Wiping cloths, 13¼x13¼, per lb.	.16	32.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.60	2.40	2.65
Roll sulphur, per 100 lb.	3.40	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.93	1.01	.98
White lead, dry or in oil	100 lb. kegs.	New York, 13.75	
Red lead dry	100 lb. kegs.	New York, 13.75	
Red lead, in oil	100 lb. kegs.	New York, 15.25	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$7.00@8.00	
Coke, prompt foundry, Connellsville	per net ton	8.00@9.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1¼ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%
Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

N. J., Jersey City—M. W. Kellogg Co., 117 Westside Ave., (pipe fittings)—gears and pinions for a gear drive.

N. Y., Adams—W. Cain—machinery and equipment for cold storage plant.

N. Y., Adams—New York Canners, Inc., H. Adams, Purch. Agt.—machinery and equipment for canning factory.

N. Y., Addison—E. J. Clark, (coal dealer)—coal handling machinery and equipment.

N. Y., Antwerp—O. A. Tucker Co. (saw mill and lumber)—machinery for sawmill and gasoline operated portable saw rig.

N. Y., Brooklyn—Haffner Eng. Service, 118 3rd St.—one air hammer.

N. Y., Buffalo—J. L. Scanlon Co., 950 Ellicott Sq.—one locomotive crane, electrically operated, 8 wheel, 15 to 25 ton capacity.

N. Y., Buffalo—Upholstered Construction Corp., 15 West Swan St., J. Coplon, Purch. Agt.—equipment for furniture factory.

N. Y., Evans Mills—Newton Schell Co.—ice cutting, harvesting and conveying machinery.

N. Y., Gouverneur—Oswegatchie Paper Co., N. R. Caswell, Purch. Agt.—wood pulp grinders.

N. Y., Jamestown—Jamestown Paint & Glass Co., Inc., 12 South Main St.—special machinery and tools for the installation of automobile window glasses and other glass work.

N. Y., Kenmore—Bd. Educ., School Dist. No. 1—vocational equipment for $500,000 school.

N. Y., Laconia—Blount Lumber Co., Inc. (dressed lumber)—sawmill machinery and equipment.

N. Y., Lorraine—Lorraine Milk Co., C. A. Brown, Purch. Agt.—milk pasteurizing and bottling machinery.

N. Y., Newark—Newark Ice & Cold Storage Co., cold storage and ice making machinery for proposed plant, capacity 60,000 bbl.

N. Y., Newburgh—W. C. McKay, 3 Front St.—hand drill and drill for blacksmith shop.

N. Y., New York—Linde Air Products Co., 30 East 42nd St.—air compressor and other equipment for new plant at Pittsburgh, Pa.

N. Y., New York—Paul Knitting Mills, 87 Leonard St., (manufacturer of hosiery), M. L. Vicharus, Purch. Agt.—15 Banner knitting machines, 3¼ in. head, with or without cylinders or sinker heads.

N. Y., Niagara Falls—B. L. Barby, 24-26 Falls St.—bakeshop equipment.

N. Y., Rochester—Michael-Sterns Co., 87 Clinton Ave. N.—machinery and equipment for clothing plant on Glasgow St., Clyde, N. Y.

N. Y., Rochester — Stromberg Carlson Telephone Mfg. Co., 1050 University Ave.—power shear for cutting 1/8 in. plate.

N. Y., Watertown—Cra-Man Specialty Corp., 425 Court St., (cabinet work and fine woodwork), W. A. Cramer, Purch. Agt.—woodworking machinery and equipment.

N. Y., Watertown—Northern New York Utilities, Inc.—machinery and equipment for the manufacture of water gas.

N. Y., Wyoming—D. Kays (job printer)—complete job shop equipment.

N. C., High Point—Union Brokerage Co.—heavy divided roll planer, 36 in. wheel band saw, motor driven.

N. C., Newton—Bd. Educ.—vocational equipment.

O., Canton—W. A. Jones Optical Co., Moose Club Bldg.—optical equipment to enlarge plant.

O., Canton—Swineford Mfg. Co., 942-8 Union Ave., S. W.—machinery and equipment for the manufacture of hardware.

O., Cleveland—Bourne-Fuller Co., Hanna Bldg.—motor driven shear for cutting light rails.

O., Cleveland—The Langenau Mfg. Co., 8403 Franklin Ave.—light squaring shears.

O., Columbus—Excelsior Seat Co., 5th Ave. (manufacturer of juvenile furniture and baby cribs), C. Boardman, Genl. Mgr.—woodworking machinery, including planer and ripsaw, to increase output of plant.

O., Lebanon—Cropper-Kinney Spring Co.—machinery and equipment for the manufacture of auto springs.

O., Massillon—Central Steel Co., G. D. Evans, Purch. Agt.—shear for cutting 1/4 in. plate.

O., Middletown—Shartle Bros. Machine Co.—one 10 ton, 40 ft. span, d.c. crane.

O., Warren—Western Reserve Lumber Co.—additional equipment including saws, planers, etc., to enlarge plant.

O., Youngstown—The Brial Hill Steel Co., Stambaugh Bldg.—one bar shear.

Okla., Atoka—Atoka Press—power job press, 10 x 15 in.

Okla., Ardmore—Gilmer Oil Co.—refinery machinery and equipment, including conveying and transmission.

Okla., Beggs—Beggs Independent—newspaper equipment.

Okla., Weatherford—The City—20 ton raw water ice plant.

Pa., Allentown—Allentown Hospital Assn.—ice and refrigeration machinery and equipment.

Pa., Allentown—Allentown Paper Box Co., 10th St.—paper box machinery for proposed factory.

Pa., Ambridge—C. Kristufek, 300 Park Ave.—air compressor, conveying, hoisting, woodworking, transmission and cement block machinery for planing mill and cement block plant.

Pa., Apollo—Apollo Steel Co., A. McCarthy, Purch. Agt.—belt conveying machinery for cinder block manufacturing plant.

Pa., Bridgeville—Universal Steel Co.—3 steam hammers, also rolling mill equipment.

Pa., Chester—Ewing-Thomas Converting Co., (silk and wool yarns), J. H. Thomas, Purch. Agt.—spindles, winders, etc., for new silk mill at Quakertown.

Pa., Duncannon—Bd. of Educ.—vocational equipment for Junior and Senior High Schools.

Pa., Greenville—Greenville Steel Car Co. one 10 ton crane.

Pa., Harbour Creek—Yerkes Steel Coupling Tie Co., W. H. Yerkes, Pres., c/o W. Kraemer Farm—machinery and equipment, including electric melting furnaces for proposed plant.

Pa., Lititz—Express Printing Co., J. G. Zook, Purch. Agt.—job press, paper cutter and other job and newspaper equipment.

Pa., New Kensington—New Kensington Ice Co., 100 7th Ave.—electric ice hoist, two ice cranes and conveying machinery.

Pa., North East—Automotive Electric Safety Corp.—special machinery for the manufacture of patented 9 point safety fuse and safety electric fire alarms.

Pa., Oakmont—Gifford Woods Co.—one small crane.

Pa., Phila.—Amer. Paper & Bag Co., 2nd and Vine Sts., S. Kardon, Purch. Agt.—paper cutters, punches, printing presses, glueing machines and folding machines.

Pa., Phila.—Pennsylvania Brick & Tile Co., Bulletin Bldg.—grinders, packers, conveyors, etc., for new plant.

Pa., Phila.—W. F. Reed & Sons, 1218 Snyder Ave. (textiles), F. C. Reed, Purch. Agt.—looms and accessories for new factory.

Pa., Phila.—Southwark Ice Co., 12th and Washington Sts.—additional refrigerating and ice manufacturing machinery.

Pa., Pittsburgh—Crucible Steel Co. of America, Oliver Bldg.—10 ton, 3 motor, 60 ft. span crane for La Belle Wks., N. S. Pittsburgh.

Pa., Reading—Carpenter Steel Co., River Rd. and Exeter St.—shear for cutting steel bars.

Pa., Saylorsburg — Acme Woodenware Co.—woodworking machinery and equipment.

Pa., Scranton—Bd. Educ.—equipment for 3 story addition to vocational school.

Pa., Warren—McKean County Refining Co., c/o F. F. Moore—oil and gasoline refinery equipment.

Pa., West Chester—E. Eachus, Bradford Ave.—bottle washers, churns, sterilizers, etc., for creamery.

S. C., Denmark—Edisto Public Service Co.—ice making machinery.

Tenn., Knoxville—C. F. Maples, c/o Appalachian Flooring Co.—electrically operated flooring mill machinery and equipment.

Tex., Caddo Mills — G. G. Bowman (harness maker)—leather working power machinery, including harness stitcher.

Tex., Canadian—M. L. Moody (job printing and newspaper)—complete printing equipment (used preferred).

Tex., Corsicana—Amer. Well & Prospecting Co., J. E. Rittersbacker, Genl. Mgr.—equipment for proposed foundry.

Tex., Dallas—Gibraltar Battery Co., A. Swanson, Pres., Lancaster and 10th Aves.—large potential charging outfit and other equipment for the manufacture of storage batteries.

Tex., Dallas—L. Keplinger, 2804 William St. (woodworker)—mortiser and band saw for power equipment.

Tex., Dallas—Texas Ice & Cold Storage Co., 4008 Commerce St.—band saw, rip saw, jointer for power attachment, also belting.

Tex., Shamrock—C. L. Jones (ice producer)—oil pull ice plant pulleys, hangers, bearings, shafting, belting and oil pull engine.

Vt., Burlington—City School Dept.—tools for manual training department of proposed $400,000 high school.

Va., City Point—Wilson-Hock Co., (machinery, etc.), N. Wilson, Mgr.—two 13 ft. 6 in. diameter x 13 ft. high cypress or yellow pine tanks; two pieces 9 or 10 in. extra heavy black pipe, 20 to 25 ft. long; two 16 in. standard flanged crosses; steam double cylinder mine hoist, reversible double friction drum, geared type preferred, approximately 30 hp. complete with boiler either vertical or locomotive type.

Va., Lynchburg—Old Dominion Box Co., 28 9th St.—box making machinery.

Va., Martinsville—Lester Lumber Co.—machinery and equipment for lumber and sawmill.

Va., Richmond—Hackley Morrison, 1708 Lewis St., (machinery)—shears for cutting scrap iron up to 2 in., 5 hp. A.C. motor and acetylene cutting torch.

Va., Richmond—Quality Press., 11 North 7th St., W. H. Bryant, Purch. Agt.—cylinder press and stapling machine.

W. Va., Fairview—Marion Constr. Co., T. R. Montgomery, Mgr.—planing mill machinery and equipment, to replace that which was destroyed by fire.

Wis., Bangor—Independent—newspaper equipment.

Wis., Elkhart Lake—Perfection Specialties Co., G. C. Trotter, Mgr.—machinery and equipment for the manufacture of radio condensors and equipment.

Wis., Green Bay—Master Self Locking Differential Co., W. M. Keley, Mgr.—machinery and equipment for the manufacture of automobile axles, brakes, etc.

Wis., Hartford—E. Ripley, Main St.—paint spraying machinery.

Wis., Madison — C. E. Baer, 219 East Main St., F. L. Kronenberg, Archt., Carroll Blk., Purch. Agt.—laundry equipment, including dryers for proposed apartment buildings.

Wis., Madison—Heilprin Fruit Co., North Bedford and West Mifflin Sts., J. Heilprin, Pres.—refrigerating machinery for proposed fruit storage warehouse.

Wis., Madison—C. Rieder, 615 University Ave.—tire pumps, air tank, vulcanizing machinery, etc., for proposed tire shop.

Wis., Madison—Valvoline Oil Co., 815 East Main St., H. R. Potter, Mgr.—additional pumps for oil and oil storage tanks.

Wis., Marshfield—S. Miller Cold Storage Co., Main St.—refrigeration machinery for proposed addition to plant.

Wis., Mazomanie—Bd. Educ., F. W. Ellsworth, Clk.—manual training equipment for new grade and high school.

Wis., Milwaukee—A. Gerlach, 920 Grant Blvd.—special machinery, motor driven, for the manufacture of macaroni.

Wis., Milwaukee — F. F. Kekow, 1211 South Pierce St., (carpenter and millwork)—combination woodworking machine.

Wis., Milwaukee—J. Mitz, 931 3rd St.—electrically driven shoe repair machinery.

Wis., Milwaukee—Purity Mfg. Co., 1098 35th St.—special machinery for proposed factory on 30th St., for the manufacture of noodles, etc.

Wis., Milwaukee—J. Zirwes, 673 Dover St. (carpenter and millwork)—combination machine and band saw.

Wis., Sheboygan—Northern Furniture Co.—power and woodworking machinery for proposed factory.

Wis., Waukesha—Harvey Paper Specialty Co., 453 West Main St.—special machinery for proposed plant.

Wis., Waukesha—Waukesha Steel Products Co., 1319 Lincoln Ave.—stamping press.

Wyo., Keeline — F. Kelley, Kelley's Ranch—complete newspaper equipment.

Man., Winipeg—Red River Paper Mills, Ltd., 232 Curry Bldg., F. Gilroy, Mgr.—paper making machinery, beaters and calenders.

N. B., Sussex—C. T. White Company—lumber mill machinery and equipment for plant at Moncton.

N. S., Bear River—Clarke Bros., Ltd. (sulphate pulp) sawmill machinery.

Ont., Gananoque—Belnois Glove Co., E. Belnois, Purch. Agt.—power operated leather cutting and trimming machinery for glove factory.

Ont., Georgetown—H. Logan—equipment for brick and tile factory, including about $3,000 worth of belting.

Ont., London — Bd. Educ., A. N. Udy, Chn.—manual training equipment for proposed $150,000 high school.

Ont., Port Arthur — Municipality of Shunials, H. A. MacKibben, Clk., 616 Whalen Bldg.—portable rock crusher capable of handling about 100 ton per day, with screen and bins.

Ont., St. Marys—F. Standeaven—additional equipment for saw and shingle mill.

Ont., Smith's Falls—Rideau Milling Co., A. Jondin, Purch. Agt.—equipment for sawmill on Jason's Island, to replace that which was destroyed by fire.

Ont., Thorold—Foley-Rieger Pulp & Paper Co., Ltd., E. P. Foley, Pres.—pulp refiner, 84 in. velvet waterman's net machine and Sturtevant fan.

Ont., Toronto—Howard Furnace Co., 881 Yonge St.—equipment for proposed air furnace factory.

Ont., Welland — No Egg Products Co., Ltd.—machinery and equipment for food products plant, to replace that which was destroyed by fire.

Ont., Woodstock—Eureka Planter Co., H. Norry, Vice Pres.—foundry equipment.

Que., Joliette—A. McArthur & Co., (building paper, wall paper, etc.), D. F. Munn, 82 McGill St., Montreal, Pres.—additional equipment to increase capacity of mill.

Que., Montreal—Canadian Paperboard Co., Ltd., 2 Seigneurs St., D. F. Robertson, Genl. Mgr.—additional machinery and equipment.

Que., Montreal—Castle & Son, 148 St. Urbain St., (cabinet makers, etc.), J. P. Dufot, Purch. Agt.—woodworking machinery and other equipment.

Que., Montreal—Montreal Quarry, Ltd., 800 Bellechane St., E. Labelle, Purch. Agt.—stone crushing equipment and drills for quarrying.

Que., Montreal—J. E. Rochon, 1150 Bellechane st., (sash and door factory)—woodworking machinery.

Que., Montreal — L. S. Tarshis & Sons, Ltd., 92 Wellington St., L. Tarshis, Purch. Agt.—power shear, steel tanks, shafting, etc.

Que., Verdun—J. P. Dupuis, Ltd., 592 Church Ave.—additional sawmill machinery.

Metal Working Shops

Calif., Los Angeles—The Ford Motor Car Co., Santa Fe Ave. and 17th St., has had plans prepared for the construction of an addition to its automobile assembling plant. J. and D. Parkinson, Title Insurance Bldg., Los Angeles, Archts.

Calif., Oakland—P. C. Bayard, Portland, Ore., awarded the contract for the construction of a 1 story factory, for the manufacture of Hall gas furnaces, on Adeline and 21st St., here. Estimated cost $5,000. McCorkle Mfg. Co., 319 12th St., Oakland, lessee.

Calif., San Francisco—F. Grimley, 317 Front St., awarded the contract for the construction of a 2 story, 50 x 155 ft. tin shop for the manufacture of cans, etc., on Shipley St. near 6th St. Estimated cost $8,000.

Calif., San Francisco — O'Brien Bros., Archts., 240 Montgomery St., are receiving bids for the construction of a 2 story, 120 x 192 ft. garage on Fell and Gough Sts., for the L. R. Lurie Co., Mills Bldg. Estimated cost $100,000. Pacific Telephone & Telegraph Co., 333 Grant Ave., lessee. Noted Jan. 4.

Calif., San Francisco—The Paige Co. of Northern California, 1665 Van Ness Ave., awarded the contract for the construction of an addition to its garage and salesroom, on Van Ness Ave. and Sacramento St. Estimated cost $60,000.

Calif., San Francisco — J. Pasqualetti, 785 Market St., awarded the contract for the construction of a 2 story, 57 x 137 ft. garage on McAllister St. near Fillmore St. Estimated cost $40,000.

Calif., San Francisco—The Stevenson Garage, Inc., c/o A. S. Bugbee, Archt., 26 Montgomery St., awarded the contract for the construction of a 2 story garage on Stevenson St. Estimated cost $50,000. Noted Jan. 4.

Calif., Taft—The Trustees of Taft Union High School Dist. will receive bids until Feb. 13 for the construction of high school buildings, consisting of auditorium, gymnasium, science, domestic science and shop buildings, and addition to present structure. Cost will exceed $200,000. W. H. Weeks, 369 Pine St., San Francisco, Archt.

Conn., Hartford — Herchman & Levine, Prospect St., are having plans prepared for the construction of a 1 story, 85 x 185 ft. addition to their garage. Estimated cost $40,000. F. C. Walz, 407 Trumbull St., Archt.

Conn., New Britain—The Stanley Wks., Myrtle St., awarded the contract for the construction of an 8 story, 60 x 100 ft. addition to its hardware factory on Church St. Estimated cost $250,000.

Ill., Chicago — The Electrical Dealers Supply Co., 121 West Randolph St., awarded the contract for the construction of a 3 story, 77 x 200 ft. factory at 2220-26 Diversey Ave. Estimated cost $150,000. Noted Dec. 28.

Ill., Chicago—P. Foote, 7900 Stony Island Ave., is receiving bids for the construction of a 1 story, 50 x 125 ft. garage on Stony Island Ave. and 79th St. Estimated cost $40,000. Kocher & Larson, 6250 South Halstead St., Chicago, Archts.

Ill., Chicago—The Ford Motor Co., Highland Park, Mich., awarded the contract for the construction of a 1 story, 502 x 1363 ft. assembly factory on Torrence Ave., here. Noted Dec. 14.

Ill., Chicago—The United Autographic Register Co., 43rd St. and Western Blvd., awarded the contract for the construction of a 2 story, 60 x 96 ft. addition to its factory. Estimated cost $40,000.

Ill., Mount Vernon—The Mount Vernon Mfg. Co. plans to rebuild its foundry, which was recently destroyed by fire. Estimated cost $100,000.

Ind., Evansville—The Evansville Structural Supply Co., 215 1st Ave., will build a 1 story, 80 x 100 ft. fabricating plant. Estimated cost $27,000. Noted Jan. 11.

Ind., Evansville — The Franklin Corp., 1116 Franklin St., is having plans prepared for the construction of a 2 story, 100 x 119 ft. automobile assembly and service station. Estimated cost $60,000. Private plans.

Ind., Fort Wayne—C. Miller, 1115 Bway., is having plans prepared for the construction of a 2 story tin and sheet metal factory. Estimated cost $30,000. Pohlmeyer & Pohlmeyer, Central Bldg., Fort Wayne, Archts.

Ky., Louisville—The Summers Hermann Co., 906 South 3rd St., plans to build a garage, automobile service and repair station. Estimated cost $125,000. Architect not announced.

Me., Rumford—The Maine Central R.R., Portland, is having plans prepared for the construction of 1 story car repair shops, etc., at its yards, here. Estimated cost $50,000. B. T. Wheeler, c/o owner, Engr.

Me., South Portland—The Maine Central R.R., Portland, is having plans prepared for the construction of 1 and 2 story car and locomotive repair shops at its terminal, here. Estimated cost $1,000,000. B. T. Wheeler, c/o owner, Engr.

Md., Baltimore—The Maryland Meter Wks., 224 North Holliday St., is having plans prepared for the construction of a 7 story, 37 x 82 ft. factory on Holliday and Saratoga Sts. Estimated cost $75,000. H. Massart, 322 North Charles St., Engr. T. W. Pietsch, Amer. Bldg., Archt.

Mass., Roxbury (Boston P. O.) — The Homestead Garage Co., 215 Columbus Ave., will build a 1 story garage with 23,000 sq.ft. of floor space on Humboldt Ave. Estimated cost $60,000.

Mich., Corunna—The Detroit Weatherproof Body Co. is having plans prepared and will receive bids in April for the construction of a 2 story, 60 x 100 ft. factory. Estimated cost $150,000. Private plans.

Minn., St. Paul—The Twin City Motor Car Co., 1420 Harmon Pl., Minneapolis, is having plans prepared for the construction of a 2 story, 60 x 138 ft. garage and sales room on 5th and Exchange Sts., here. Estimated cost $50,000. Toltz, King & Day, 1410 Pioneer Bldg., St. Paul, Archts..

N. Y., Canton—James, Inc., Factory St., Watertown, has purchased site and plans to build a garage, machine shop and repair plant, here. Cost between $12,000 and $15,000.

N. Y., Lackawanna (Buffalo P. O.)—The Seneca Iron & Steel Co., 307 Erie County Bank Bldg., Buffalo, has purchased a 6 acre site and plans to build a plant for the manufacture of steel sheets, here. Architect not selected.

N. Y., New York—The Maux Realty Corp., c/o J. J. Dunnigan, Engr. and Archt., 3946 East 150th St., is having plans prepared for the construction of a 2 story garage on Southern Blvd. Estimated cost $65,000.

N. Y., New York—The F. L. Smithe Machine Co., 11th Ave. and 21st St., will soon receive bids for the construction of a 5 story, 127 x 215 ft. machine shop on 12th Ave. and 44th St. W. M. Cory, 30 Church St., Engr.

N. Y., New York—The Transit Comn., 49 Lafayette St., is receiving bids until Feb. 1, for structural steel work on 3rd addition to shops at Lenox Ave. and 148th St. Noted Nov. 2.

N. Y., New York—E. M. H. Wright, c/o J. De Hart, Engr. and Archt., 1039 Fox St., will soon receive bids for the construction of a 1 story, 200 x 200 ft. garage on 56th St. and Ave. A. Estimated cost $50,000.

O., Canton — The Swineford Mfg. Co., 942-8 Union Ave., S. W., manufacturer of hardware specialties, plans to rebuild its 2 story factory, which was recently destroyed by fire. Estimated cost $100,000.

O., Cleveland — The Clover Meadow Creamery Co., c/o J. T. Kofron, Mgr., 1823 East 55th St., is receiving bids until Feb. 15 for the construction of a 1 story, 80 x 92 ft. garage on East 57th St. and Belvidere Ave. Estimated cost $40,000. Private plans.

O., Cleveland—W. Rosenweig, Society for Savings Bldg., is receiving bids for the construction of a 1 story, 88 x 100 ft. garage at 3834 Prospect Ave. Estimated cost $40,000. H. F. Janowitz, Permanent Bldg., Cleveland, Archt.

O., Cleveland—The W. S. Tyler Co., 3615 Superior Ave., (ornamental iron works), is having plans prepared for the construction of a 3 or 4 story factory at 3803 Superior Ave. Estimated cost $500,000. C. Zimmerman, Pres. G. S. Rider & Co., Century Bldg., Cleveland, Archts.

O., Columbus—The Ohio State Stove & Mfg. Co., foot of Buttles Ave., will build a 32 x 90 ft. factory. W. H. Packer, Supt.

Pa., Harbour Creek—The Yerkes Steel Coupling Tie Co., c/o W. Kraemer Farm, plans to build a 40 x 100 ft. steel tie plant on a 10 acre site. W. H. Yerkes, Pres. Architect not announced.

Pa., Midland—The Crucible Steel Co. of America, 2012 Olivia Bldg., Pittsburgh, is having plans prepared for the construction of a 1 story liquid purification plant, here. Estimated cost $60,000. Koppers Co., Union Arcade, Pittsburgh, Archts.

Pa., Pittsburgh—C. P. Hitchins, Archt., Citizens Bank Bldg., is receiving bids for the construction of a 1 story 40 x 50 ft. garage and sales room on Bigelow Blvd. for the United States Auto Parts Co., c/o Archt. Estimated cost $60,000.

Pa., Pittsburgh—The McKinney Mfg. Co., N. S. Pittsburgh, manufacturer of hinges, bolts, etc., is having plans prepared for the construction of an addition to its manufacturing and storage building on Pennsylsylvania and Preble Sts. Hunting Davis Co., Century Bldg., Pittsburgh, Archts.

Pa., Warren—The W. H. Frost Co. plans to build a 40 x 70 ft. garage and salesroom on Liberty St. Cost will exceed $40,000. Architect not announced.

R. I., Woonsocket—The Woonsocket Machine & Press Co., 533 2nd Ave., will soon award the contract for the construction of a 2 story, 50 x 100 ft. addition to its plant, for the manufacture of woolen machinery. Estimated cost $40,000. Private plans.

Tex., Corsicana—The Amer. Well & Prospecting Co. is having plans prepared for the construction of a foundry. Estimated cost $100,000. J. E. Rittersbacker, Genl. Mgr. Architect not announced.

W. Va., Charleston—The Kanawha Mfg. Co., manufacturer of boilers and mine equipment, is receiving bids for the construction of a 1 and 2 story plant on Ruffner Ave. Warne, Tucker & Patterson, Charleston, Archts.

Wis., Beloit—The Gaston Scale Co., 715 2nd St., plans to rebuild its 2 story scale factory, which was recently destroyed by fire. Estimated cost $50,000. Architect not selected.

Wis., Hartford—E. Ripley, proprietor of Buick garage, plans to build a 1 story, 50 x 100 or 100 x 100 ft. paint shop and storage addition to garage on Main St. Cost between $40,000 and $50,000. Architect not selected.

Wis., West Allis—The Burbach Service Station, 5225 Greenfield Ave., is having plans prepared for the construction of a 2 story, 60 x 87 ft. garage. Estimated cost $40,000. J. Schunk, 521 51st Ave., West Allis, Archt.

Ont., Ford — Merlo, Merlo & Ray, contractors, will build a machine shop and garage. Estimated cost $30,000.

Ont., London—The City Council plans to build a garage and machine shop for civic owned cars and trucks. G. Wenige, City Hall, mayor.

Ont., Toronto — The Howard Furnace Co., 881 Yonge St., awarded the contract for the construction of a 2 story, 40 x 100 ft. air furnace factory. Estimated cost $50,000.

General Manufacturing

Ark., Star City—The Ozark Timber & Stave Co. plans to rebuild its stave mill, which was destroyed by fire. Estimated cost $70,000. Architect not announced.

California — The Kings Food Products Co., Salem, Ore., is conferring with Yuba City Chamber of Commerce regarding construction of dehydrating plant in northern California. Estimated cost of first unit $100,000.

Calif., Azusa—The Azusa Ice & Cold Storage Co. plans to rebuild its ice manufacturing and cold storage plant, which was destroyed by fire. Estimated cost $100,000. Architect not announced.

Calif., Fresno—The Danish Creamery Co., E. and Inyo Sts., plans to build an addition to its creamery. Estimated cost $5,000. J. R. Murphy, Genl. Mgr.

Calif., Fresno—The German Publishing Co. plans to build a 1 story publishing plant on Monterey and California Sts. Estimated cost, $6,000. H. B. Bier, Secy.

Calif., Hayward—The Jersey Creamery Co., 568 Main St., plans to build a creamery. Architect not selected.

Calif., Loleta—Libby, McNeil & Libby, Merchants Exc. Bldg., San Francisco, are having plans prepared for the construction of a 2 story, 75 x 160 ft. milk condensing plant, here. Private plans.

Calif., Oakland—The California Packing Corp., 101 California St., San Francisco, awarded the contract for the construction of a 1 and 2 story canning plant on Linden St., also for a cannery and warehouse buildings on Filbert St. near 1st St. Estimated costs $62,250 and $23,438 respectively. Noted Dec. 28.

Calif., Petaluma — The Petaluma Ice & Cold Storage Co., branch office of Natl. Ice & Cold Storage Co., Postal Telegraph Bldg., San Francisco, awarded the contract for alterations and additions to its cold storage plant, here. Estimated cost $20,000.

Calif., San Francisco — The Fairy Ice Cream Co., 741 Fulton St., awarded the contract for the construction of a 1 story, 102 x 112 ft. ice cream plant on Mission and 10th Sts. Estimated cost $15,000.

Calif., Santa Rosa—The Natl. Ice & Cold storage Co., Postal Telegraph Bldg., San Francisco, is having plans prepared for the construction of an addition to its cold storage plant, here. Estimated cost $100,000. Private plans.

Calif., Tehachapi — The Henry Cowell Lime & Cement Co., 2 Market St., San Francisco, plans to build a cement plant, here. Estimated cost $3,000,000. W. H. George, Secy. and Purch. Agt.

Calif., Walnut Creek—The Pacific Cellulose Co. plans to build 2 buildings for the manufacture of artificial silk from cotton, wood and other materials, on a 6 acre site. E. A. Schwartz, Secy.

Conn., New Haven—The Waldorf Systems, Inc., 169 High St., Boston, awarded the contract for the construction of a 1 story, 75 x 95 ft. bakery and commissary building on Olive and Green Sts., here. Estimated cost $50,000.

Conn., Waterbury—The Amer. Republican, Inc., plans to build a 4 story, 50 x 102 ft. publishing plant on Leavenworth St. and Printers' Court. Estimated cost $150,000. Architect not announced.

Ill., Chicago—J. A. Dubow, 2234 Cromwell St., manufacturer of gloves, awarded the contract for the construction of a 2 story, 25 x 54 ft. addition to factory. Estimated cost $10,000. Noted Jan. 4.

Ill., Chicago—C. O. Kuehne, Archt., 1572 North Halstead St., is receiving bids for the construction of a 1 story, 100 x 125 ft. addition to furniture factory, for A. Hausske & Co., 869 Weed St. Estimated cost $45,000.

Ill., Chicago—The Stationers Engraving Co., 319 North Albany Ave., awarded the contract for the construction of a 2 story, 90 x 150 ft. factory at 3115-23 Carroll St. Estimated cost $65,000.

Ill., Chicago — The Superior Furniture Co., 3301 West 47th St., awarded the contract for the construction of a 3 story, 113 x 140 ft. factory. Estimated cost $90,000.

Ill., Chicago—The Universal Furniture Co., 3042 West Chicago Ave., awarded the contract for the construction of a 1 story 40 x 100 ft. addition to its factory. Estimated cost $15,000.

Ind., Cannelton—The Cannelton Sewer Pipe Co. awarded the contract for the construction of a 4 story, 75 x 130 ft. sewer pipe factory, including 32 kilns, 120 ft. radial stack, power plant and 1,000 ft. switching tracks. Estimated cost $200,000. Noted Dec. 28.

Ind., Indianapolis — The Indianapolis Glove Co., 430 North Liberty St., is receiving bids for the construction of a 5 story, 100 x 160 ft. glove factory. Estimated cost $225,000. Rubush & Hunter, Amer. Central Life Bldg., Archts. Noted Dec. 28.

Ind., South Bend—The Superior Laundry Co. awarded the contract for the construction of a 2 story, 60 x 150 ft. laundry on Sycamore St. Estimated cost $40,000.

Kan., Wichita — The Conway Springs Water Co., 223 South Wichita St., plans to build a 1 story bottling plant. Estimated cost $50,000. Architect not selected.

La., Carson—The Delta Land & Timber Co. plans to rebuild its lumber mill, which was destroyed by fire. Estimated cost $150,000.

Me., Richmond—The Richmond Worsted Spinning Co., Front St., is having plans prepared for the construction of a 1 story, 40 x 112 ft. addition to its worsted goods mill. Estimated cost $25,000. Private plans.

Md., Curtis Bay (Baltimore P. O.)—The United States Industrial Alcohol Co., c/o C. Haner, Supt., is having plans prepared for the construction of a 1 story, 60 x 180 ft. addition to its factory. Estimated cost $25,000. S. Moore, Archt.

Mass., Worcester — The G. C. Whitney Co., 67 Union St., art publishers, having plans prepared for the construction of a 6 story, 55 x 60 ft. addition to its plant. Estimated cost $50,000. Lockwood, Greene & Co., 24 Federal St., Boston, Engrs. and Archts.

Mich., Detroit—The Schroeder Paint & Glass Co., Cadillac Sq., awarded the contract for the construction of a 4 story, 125 x 195 ft. paint factory on 12th St. along Grand Trunk Ry. tracks. Estimated cost $300,000.

Minn., Red Wing—The Red Wing Sewer Pipe Co. will build a 3 story, 52 x 272 ft. dry house. Estimated cost $85,000. W. Walter, Pres.

Mo., Kansas City—The Schreiber Flour & Cereal Co., 223 West 8th St., plans to rebuild its mill, which was destroyed by fire. Loss between $125,000 and $150,000. Architect not selected.

Mo., Leeds—The Blue Valley Ice & Storage Co., is having plans prepared for the construction of a 2 story ice manufacturing and cold storage plant, capacity 200 ton per day, including a 32 x 80 ft. storage unit and a 35 x 81 ft. engine room. H. Von Unwerth, 509 Finance Bldg., Kansas City, Engr.

Mo., St. Louis—The Pioneer Cooperage Co., 2210 Dekalb St., awarded the contract for the construction of a 2 story, 50 x 75 ft. box factory at 2210 Kosciusko St. Estimated cost $15,000.

N. J., Camden—The Victor Talking Machine Co., Front and Cooper Sts., awarded the contract for the construction of an 8 story, 70 x 435 ft. manufacturing building and a 2 story, 90 x 230 ft. addition to plant. Estimated cost $1,300,000.

N. Y., Brooklyn—R. G. Cory, Engr. and Archt., 30 Church St., New York City, will receive bids until Jan. 31 for the construction of a factory for the manufacture of bronze powders on Lorraine St., here, for Gerstendorfer Bros., 231 East 42nd St., New York City. Estimated cost $500,000.

N. Y., Buffalo—Kaser's Art Shop, c/o F. C. Kaser, 45 Brown St., plans to build a 2 story, 25 x 67 ft. addition to its leather factory, for the manufacture of handbags and novelties. Estimated cost $5,000. Architect not announced.

N. Y., Deferiet—The St. Regis Paper Co., c/o C. C. Burns, Watertown, plans to build a grinding plant at its mill, here. Cost between $50,000 and $60,000.

N. Y., New York—H. Heide, 313 Greenwich St., will soon receive bids for the construction of a candy factory on Vandam St. Estimated cost $200,000. Maynicke & Franke, 25 East 26th St., Engrs. and Archts.

N. Y., Tonawanda—The Amer. Kardex Co., Main St., will build [illegible] addition to its plant. Noted Jan. 4.

O., Cleveland—The Amer. Gypsum Co., Discount Bldg., plans to build a mill at 2146 West 3rd St. Estimated cost $100,000. A. C. Stewart, Mgr. Private plans.

O., Dayton — The Johnson-Watson Co., 131 East 3rd St., plans to build a 6 story printing plant. Estimated cost $500,000. Architect not selected.

Okla., Weatherford—The city will vote on a bond issue Jan. 23, for the construction of a 1 story, 80 x 120 ft., 20 ton ice plant and 500 hp. power plant, on Bradley St. Estimated cost $114,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma City, Engrs.

Penna., Allentown—The Allentown Paper Box Co., 10th St., plans to build a 3 story, 100 x 120 ft. box factory on Jefferson St. H. O. Ritter, Dir. Architect not announced.

Pa., Apollo—The Apollo Steel Co., 940 Penn Ave., Pittsburgh, will build a 1 story, 40 x 200 ft. cinder block plant on Warren Ave., here. Estimated cost $30,000.

Pa., Centerville — The Supplee, Wills, Jones Milk Co. plans to build a condensery. Estimated cost $8,000. Architect not announced.

Pa., New Kensington — The New Kensington Ice Co. is receiving bids for the construction of a 1 story, 40 x 70 ft. ice plant on 2nd Ave. and 7th St. Estimated cost $50,000. Private plans.

Pa., Pittsburgh—The Meyers Printing Co., 6309 Broad St., awarded the contract for the construction of a 1 and 2 story, 24 x 110 ft. printing plant at 5717 Broad St. Estimated cost $28,000.

Pa., Pittsburgh—The Red Dog Products Corp., 613 Bessemer Bldg., plans to build a plant for the manufacture of tile on Clifford St. Estimated cost $50,000. Private plans.

R. I., Woonsocket — A. E. Bonin, 137 Oakley Rd., awarded the contract for the construction of a 2 story, 104 x 106 ft. textile mill with 15 x 31 ft. ell, on Mendon Rd. Estimated cost $75,000

Tenn., Nashville—H. A. Buchl, 5th and Union Sts., will build a 1 story carbonating gas factory at 705 18th Ave. North. Estimated cost $7,000.

Tex., Fort Worth—The Parker Browne Co., 1302 Pacific St., is having preliminary plans prepared for the construction of a 3 story, 75 x 150 ft. addition to its factory for the manufacture of extracts and soda fountain supplies, on East Front and Oak Sts. Estimated cost $75,000. M. Greenspun, Pres. Architect not selected.

Wash., Walla Walla—The Whitman Canning Co. plans to build a cannery. Estimated cost $100,000.

Wash., Kettle Falls — The White Pine Sash Co., Myrtle St. along tracks of Union Pacific R.R., is having plans prepared for the construction of a band sawmill, here. Estimated cost $150,000. F. W. Horstkotte, Mohawk Bldg., Spokane, Archt.

Wis., Fort Atkinson—The Fort Atkinson Canning Co. is having plans prepared for the construction of a canning plant consisting of a 3 story, 48 x 135 ft. factory building, a 1 story 42 x 148 ft. warehouse, a 1 story, 50 x 50 ft. cooking room, a 1 story, 30 x 40 ft. boiler house and a 1 story, 54 x 84 ft. vinery and shed. Estimated cost $150,000. McMeans & Tripp, 510 Majestic Bldg., Indianapolis, Engrs.

Wis., Madison—The Kennedy Dairy Co., 618 University Ave., awarded the contract for the construction of a 1 story, 50 x 75 ft. ice plant. Estimated cost $40,000. Noted July 13.

Wis., Milwaukee—The Ricketson Mineral Paint Wks., 97 Wisconsin St., awarded the contract for the construction of a 2 and 3 story, 63 x 68 ft. paint mill on Wilcox St. Estimated cost $20,000.

Wis., Sheboygan—The city awarded the contract for the construction of a 1 story, 76 x 108 ft. carpenter shop on South Water St. Estimated cost, $40,000. J. Steimle Clk. Noted Dec. 21.

Wis., Watertown—The Perfection Table Slide Co. awarded the contract for the construction of a 2 story factory for the manufacture of table slides. Estimated cost $50,000. W. C. Schulz, Mgr.

Wis., West Allis—The Gas Tank Recharging Co., 1245 23rd Ave., Milwaukee, awarded the contract for the construction of a 1 story manufacturing plant on 60th Ave., here. Estimated cost $65,000. Noted Jan. 4.

Ont., Bowmanville—The Thomson Knitting Co. is building a knitting factory. Estimated cost $100,000.

Ont., Brampton — The J. W. Hewitson Shoe Co. plans to build an addition to its shoe factory. Estimated cost $50,000. Architect not selected.

Ont., Stratford—Stratford Frames & Novelties plans to build a factory. Estimated cost $50,000. N. M. Upshall, Mgr. Noted Dec. 14.

Ont., Toronto—The Barrymore Cloth Co., 1179 King St., W., plans to build a textile factory on Dufferin St. Estimated cost $150,000. Architect not selected.